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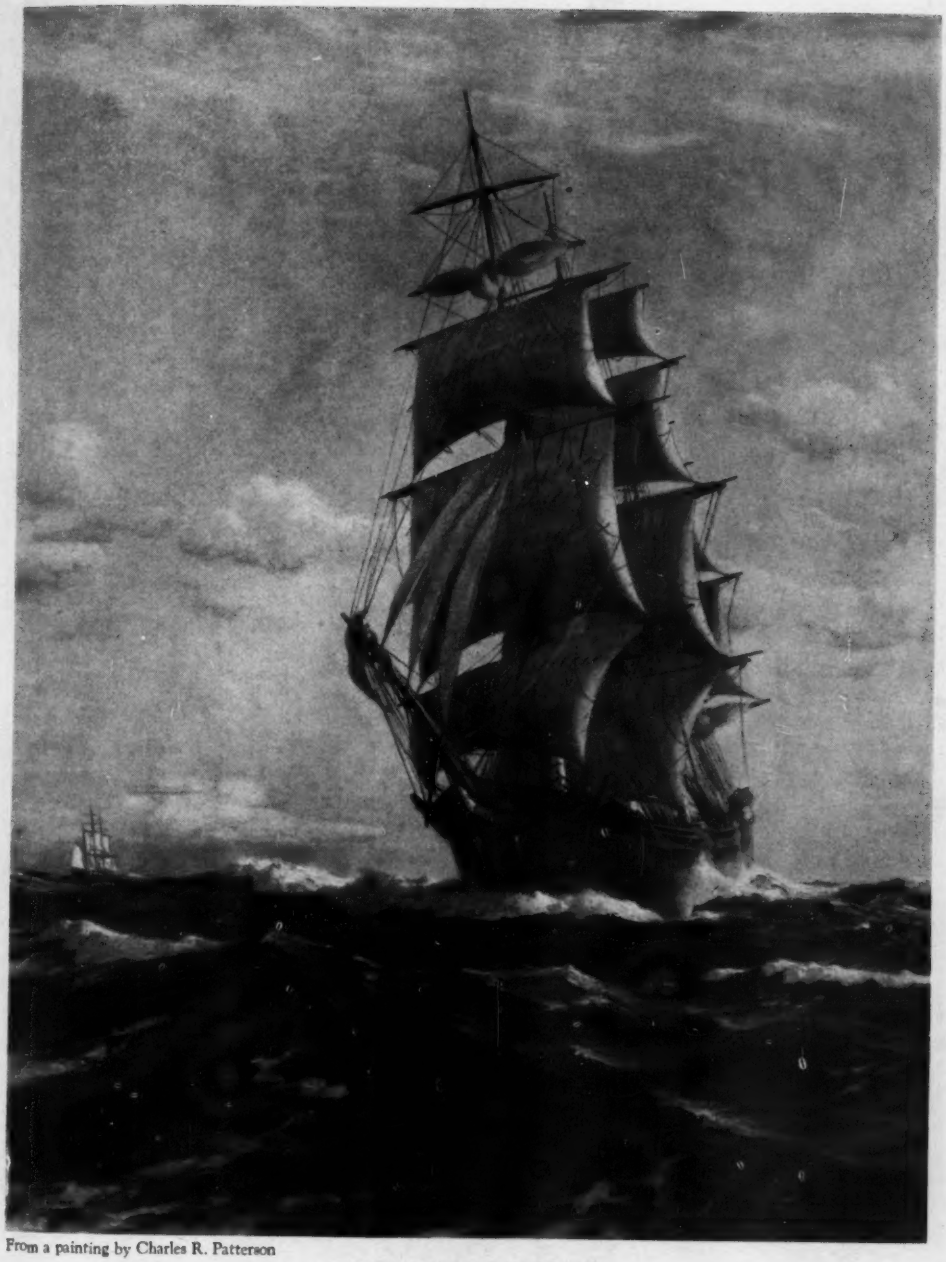


From a painting by Charles R. Patterson

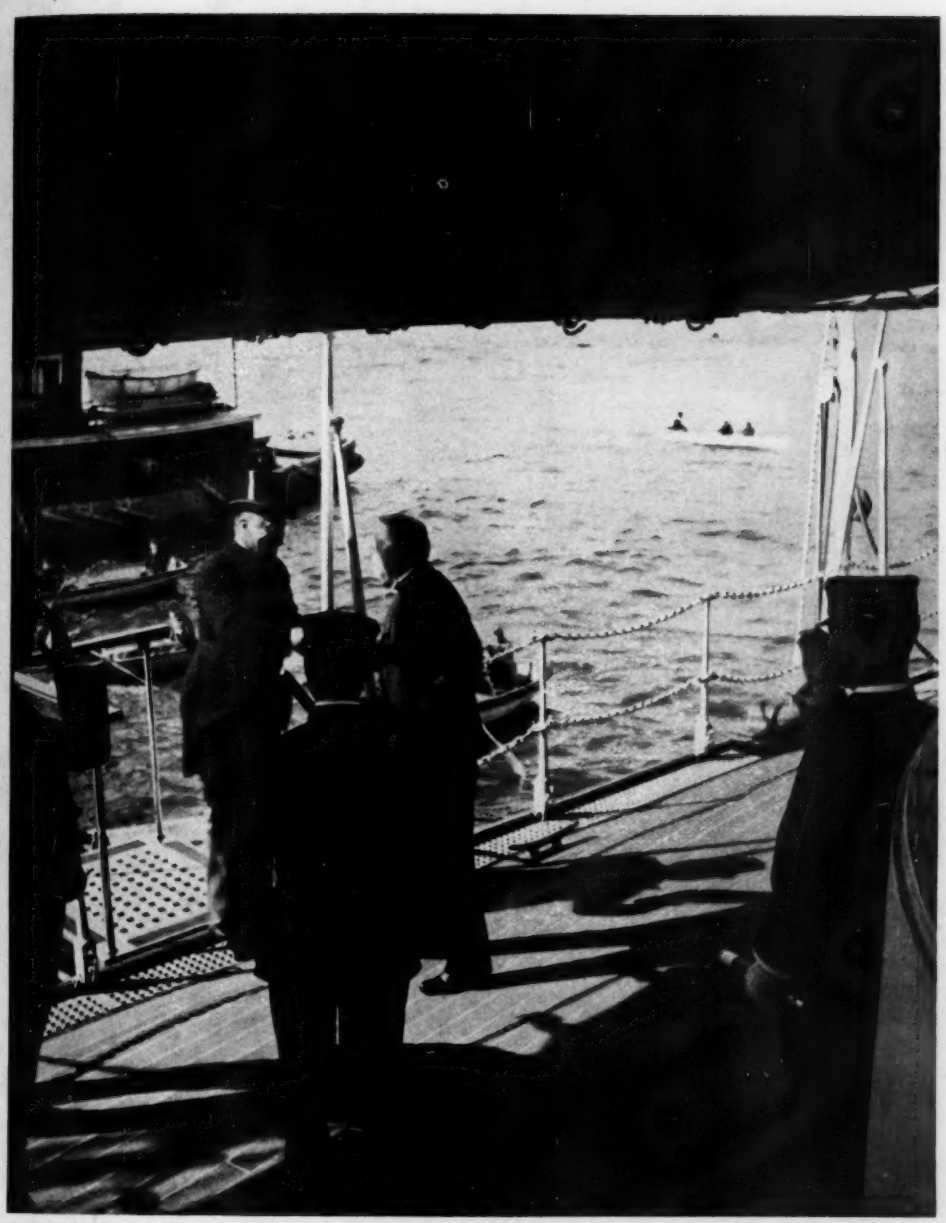
THE ROMANTIC DAYS OF SAIL

Clipper ship *Sovereign of the Seas.* Built by Donald McKay in 1852.

Courtesy Clinedinst Studio, Washington, D. C

THE GREAT AMERICAN

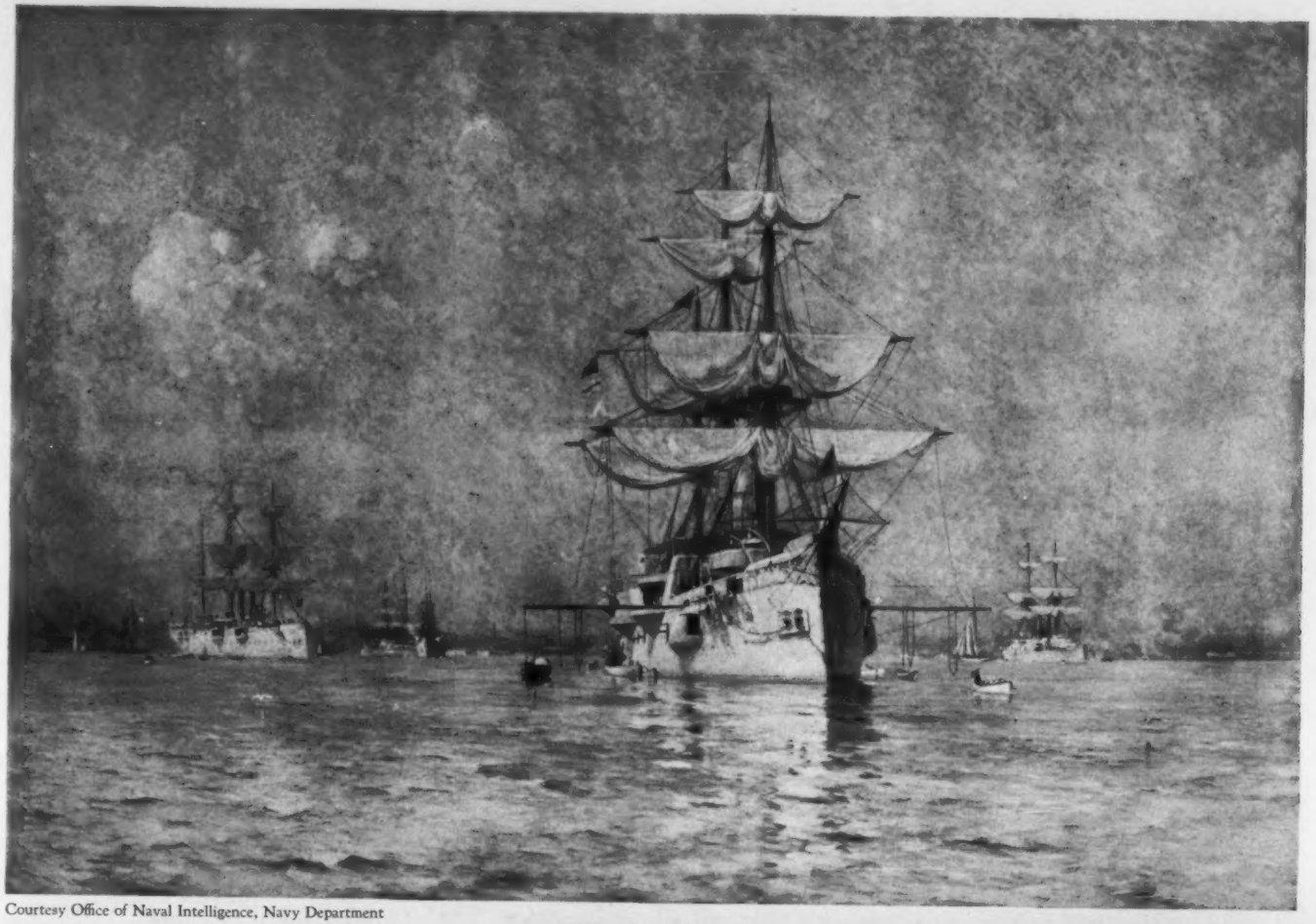
"A nation should never fight unless forced to; but it should always be ready to fight." THEODORE ROOSEVELT.



Courtesy International News reel

"DELIGHTED!"

Admiral Dewey receives Governor Roosevelt aboard his flagship, the U.S.S. *Olympia*, in North River, New York, 1899. Admiral Dewey had just brought his fleet back from Manila.



Courtesy Office of Naval Intelligence, Navy Department

THE WHITE SQUADRON

From left to right: *Newark*, *Boston*, *Yorktown*, *Chicago* (flagship) and *Atlanta*. The painting was made about 1893.

THE WHITE SQUADRON

From left to right: *Newark*, *Boston*, *Yorktown*, *Chicago* (flagship) and *Atlanta*. The painting was made about 1893.

Courtesy Office of Naval Intelligence, Navy Department

SAILORMEN WITH TIN HATS!

Color guard of U.S.S. *Pittsburgh* on Nanking Road, Shanghai, machine gun detachment in the rear.

From a painting by Charles R. Patterson

THE *NOURMAHAL*
Flagship of the New York Yacht Club. Owner, Mr. Vincent Astor.

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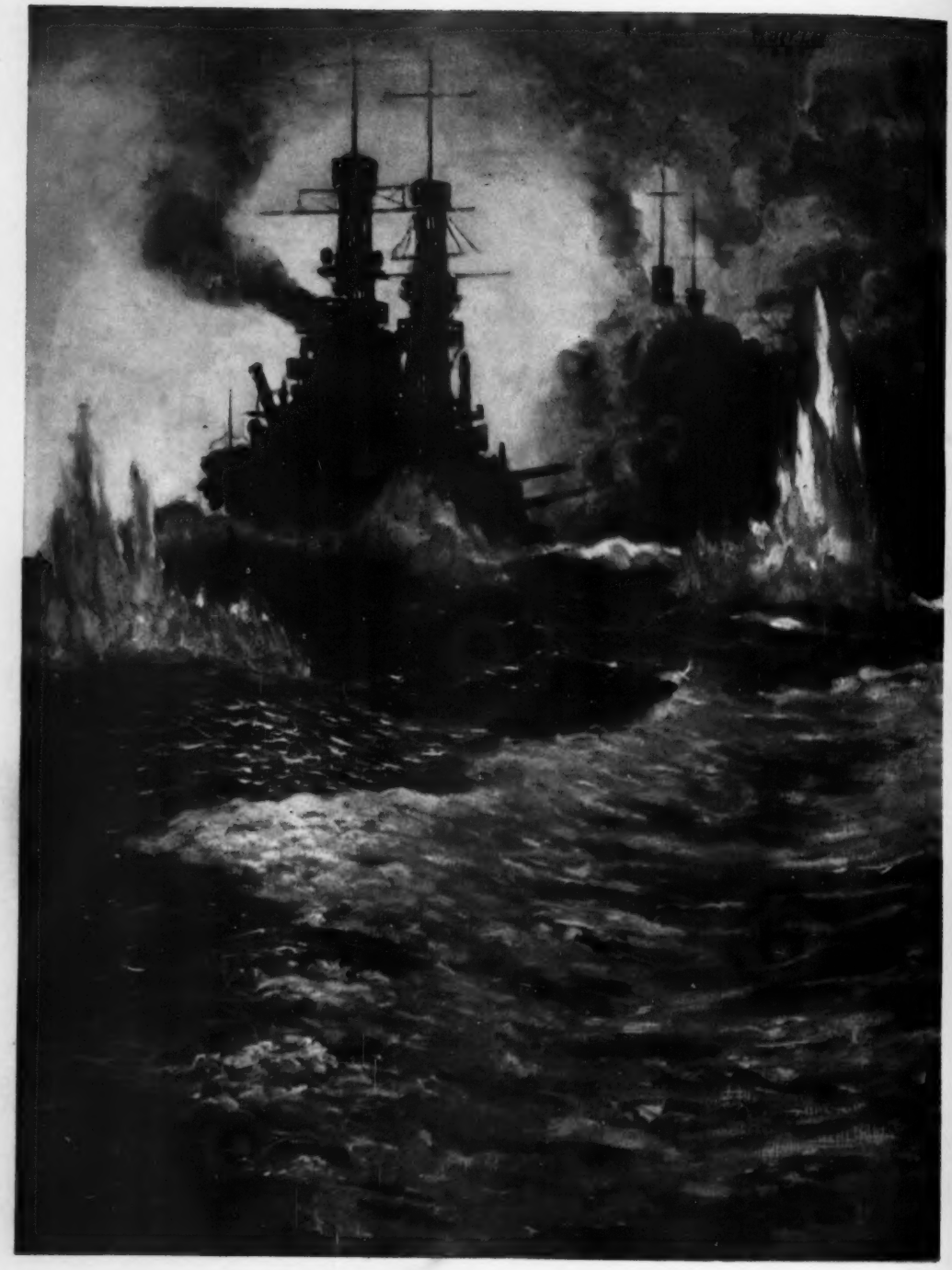
Flagship of the New York Yacht Club. Owner, Mr. Vincent Astor.

UNIV. OF MICH.



The Age of Steam

(Courtesy of Lucky Bag Committee Class of 1926, U. S. N. A., Copyrighted)

UNITED STATES
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Elements *and* Outlook *of* American Sea-Power

By WILLIAM HOWARD GARDINER
President of the Navy League of the United States

I.

IN THE *Revue des Deux Mondes* for October, 1902, Auguste Moireau said: "After his first book, and especially from 1895 on, Mahan supplied the sound basis for all thought on naval and maritime affairs; and it was seen clearly that sea-power was the principle which, adhered to or departed from, would determine whether empires should stand or fall."

To that generation of Americans, still absorbed in the internal development of our country and not foreseeing the external consequences of that economic evolution, such matters seemed of little interest and of no concern. And even after the conduct and control of maritime communications—sea-power—had determined the outcome of the titanic fighting in France and whether the British Empire or the German Empire should stand or fall in 1918, Mahan still remained a closed book to most Americans. For his deductions had been drawn, in the main, from the history of England's rise to world primacy during the overseas expansion of European civilization. Why study the influence of English sea-power upon European rivals in the seventeenth and eighteenth centuries when one is concerned with twentieth century America!

But from his studies Mahan not only deduced certain relationships between prosperity at home, overseas trade and shipping, naval power, and influence of all kinds abroad, but he also distinguished the more basic natural and human elements of sea-power. And although world conditions—other than geography and human nature—have changed profoundly since the epic era of which he wrote, the principles he deduced remain for the guidance of those sufficiently sophisticated to realize that a discriminating understanding of the past is the best illuminant of the future.

II. ECONOMIC CENTERS AND OVERSEAS INTERESTS

Unquestionably the greatest change of late in the world is that, whereas Europe was the sole center of world-wide economic and political power before the twentieth century dawned, the politico-economic organism that has developed in North America already equals that of all of non-Russian Europe in most essential respects. Without stopping to rehearse reams of statistics, it may be fairly said that the economic productivity of North America and that of Europe, west of Russia, each amounts to about a third of the total for the world—and that ours is growing the more rapidly and is by far the greatest per capita.

Similarly, the trade of industrial Europe with other parts of the world and the overseas trade of America are about equally important and world-wide. Indeed, of late,

they have come to resemble each other quite closely. For in the main, both America and Europe import foodstuffs and crude materials, bought largely in competition with each other in the tropics and southern hemisphere; and both export preponderantly manufactures, sold, again in competition with each other, to the less industrialized areas of the world.

Thus the imports of the United States from across the Pacific and Caribbean are about twice as great as those from Europe. Nearly three-fifths of our exports are manufactures; and most of the latter go to Latin-America and to trans-Pacific countries. But although the United States imports over $250,000,000 more of foodstuffs than we export, yet our food exports to Europe still exceed our food imports from there by nearly $400,000,000. And the fact that our exports of finished manufactures to Europe exceed similar imports we receive from there by more than $100,000,000 speaks volumes for our industrial efficiency —and for the efficacy of our own shipping lines, direct to the Continent, that by-pass England as an *entrepôt*.

Of late much emphasis has been laid not only on the importance of our sales abroad to our prosperity at home but also on the necessity of assured imports of such essential key materials as are manganese, rubber and tin to our great steel, automobile and canning industries. In such respects American industry has become substantially as dependent on overseas trade as that of Europe long has been.

Another development similar to what has occurred in Europe, and especially in England, is that our great wealth-producing organization is creating so much surplus capital as to lower rates of return on our domestic investments and to force overseas American capital seeking the higher profits obtainable in less advanced countries. With a world-wide trade not exceeded in importance by that of any other country and with other overseas interests rapidly increasing, commensurate political consideration, at home as well as abroad, and adequate means of communication and protection, will be insistently demanded.

As American overseas possessions and interests already amount to more than the total wealth of our country merely fifty years ago, and as they play the still more valuable functions in our internal economy suggested above, understanding of the long recognized principles underlying overseas communications and security seems essential.

III. The Elements of Sea-Power

Sea-power proper is merely the expressed ability of a people to conduct and to control both the mercantile and martial transportation, by sea or overseas, of ideas, persons and materials, more or less extensively both in war and in peace. It arises from the desires of peoples to have products from diverse lands interchanged. The conducting of such exchanges calls commensurate "shipping power" into being and leads to overseas interests. Safeguarding and fostering these, policing the seas in peace, and controlling the use of the seas in war, call for naval power. Thus maritime trade is the parent of shipping power; shipping power is the parent of naval power; and these two together are the principal constituents of sea-power proper. It should be realized, however, that all means of transporting ideas, persons and materials overseas, when so used, are constituents of sea-power, whether they be ships, cables, aircraft, or radio communications.

Rather than discuss various manifestations of sea-power proper, the purpose here is to consider very briefly its basic elements, as Mahan deduced them, mainly from England, and as they now apply to America. On page 28 of his immortal book, *The Influence of Sea-Power upon History*, he said:

> The principal conditions affecting the sea-power of nations may be enumerated as follows: I. Geographical position. II. Physical conformation, including, as connected therewith, natural production and climate. III. Extent of territory. IV. Number of population. V. Character of the people. VI. Character of the government, including therein the national institutions.

IV. Geographical Position

Mahan points out that if a nation has no land boundaries it must defend, or across which it may expand, as is the case with England and Japan, then, its outlook being entirely transmaritime, it enjoys a special stimulus toward sea-power not possessed by such nations as Germany, France and the Netherlands, whose open frontiers with trading and aggressive neighbors have ever divided their economic relations and martial preoccupations between overland and overseas operations.

In so far as the United States has overland economic relations with Canada and Mexico, our concentration on overseas operations is handicapped. But Mexico is much less of a military menace to the United States than Scotland was to Elizabethan England. And Canada, quite the contrary to being of itself a military menace to us, has a hostage value that we would lose if Canada were not to remain within the British Empire. While virtually impotent to do serious military damage of themselves to the United States, either Canada or Mexico might serve as landing points for forces aimed at the United States from across the Atlantic or Pacific—as, indeed, some "bridgehead" might be secured on our own coasts. But as any conceivable martial menace of moment to the United States would be transoceanic in its real origin, it should be met and parried at sea. Thus the defense of the United States is primarily, not to say almost wholly, a naval matter. And under such circumstances, it is natural to look upon the North American continent as, in effect, a greater England.

Mahan also pointed out how important it is to a maritime nation to be situated as both England and Japan are, so that their fleets and cruisers can conveniently dominate the coasts and trade of the continents contiguous to them. And to this naval view should be added the mercantile point that such a position is of great economic value; for it facilitates their becoming the commercial *entrepôt*, finishing factory, and clearing house for the world's trade with their continental neighbors. It should be noted, however, that the economic, political and martial advantages of such positions are regional—for England with Western Europe, and for Japan with Eastern Asia.

On the other hand, study of the world map, in the light of Mahan's teachings and of the twentieth century internal development of the United States, together with our ever-increasing dependence on overseas supplies and sales, inevitably led the present writer to propose that North America, rather than being a self-sufficient continent, should be considered as a great, mid-oceanic island. For not only are our economic, political, and all other relations with other parts of the world immutably overseas matters — involving, of necessity, some form of sea-power—but we are in the center of the maritime world, three thousand miles from Europe, four thousand from Asia, and fifteen hundred from South America. Such a central, non-regional position has its obvious advantages for trade with all parts of the world, although long range in every direction. But it may necessitate the exercise transoceanically of whatever influences may be needed to prevent regional powers from unduly blanketing their respective continental backgrounds.

V. Physical Conformation

Mahan points out that numerous and deep harbors may be a source of great wealth and of strength at sea," especially if such harbors are the outlets of long navigable rivers down which the products of the interior can flow to the seaboard.

We have many good harbors on the Atlantic but comparatively few on the Pacific; and mountain ranges near both coasts prevent these harbors from being fed by navigable rivers, flowing from the far interior, except in the case of the St. Lawrence, which is ice bound in winter. Thomas Jefferson recognized, however, that a very great proportion of the trade of the United States eventually would flow down the Mississippi Valley to the Gulf of Mexico. Here we have a great navigable river system draining virtually the whole area from Canada and between the Appalachian and Rocky Mountains; and no mountain barrier opposes the easy development of highways, canals, and railroads over this great plain to aid the concentration of products at our Gulf ports.

The importance of this becomes more manifest when it is recalled that the Mississippi watershed not only raises by far the greater part of our agricultural products and contains most of our stores of crude materials but is rapidly becoming the principal scene of our industrial activity. And it is also noteworthy that our Gulf ports are the natural outlets for our trade not only to the southward but through the Panama Canal and across the Pacific. There are definite signs that the people of the Mississippi Valley are realizing more clearly their advantageous position and how directly their profits are related to sales overseas of their surplus production. As such understanding grows we may expect them and their politicians to push as energetically as some from the coastal states for the development of

foreign trade and the shipping and naval power essential to it.

After considering coastal and interior topography, Mahan pointed out that, because the French found their bounteous homeland virtually sufficient for their sustenance, they were little inclined to overseas adventure and the development of sea-power; but that, by contrast, the very limited natural resources of medieval England and of the Netherlands impelled their inhabitants to overseas colonization and trading, from which their shipping and naval power grew naturally.

In this connection we should recall that the limited opportunities in our North Atlantic states were some of the principal causes of our early development as a great shipping and trading nation before our lands west of the Alleghenies were explored and claimed practically all our energies. But now our inland development has progressed so far that great industrial as well as agricultural surpluses, salable only overseas, are produced; and this same development has necessitated large imports of key materials.

Naturally, this state of affairs is at the root of the somewhat fumbling beginnings we are now witnessing of our return to overseas trading and maritime activity on an unprecedented scale.

VI. Extent of Territory

Mahan seems to have concentrated his attention on the military aspect of this factor, pointing out that the proportion of a country's inhabitants to the length of its coast line and to the character of its harbors is the factor to be considered rather than its area, and saying: "A country in this is like a fortress; the garrison must be proportionate to the *enceinte*."

There is much more to be said, however, on the economic side as to extent of territory and its disposition. Naturally, the greater the territory inhabited by a numerous and productive people, the greater will be the economic organization requiring overseas trading and capable of supporting a proportionate measure of sea-power. And conversely, a politico-economic area that has developed virtually the full measure of overseas trade, shipping and naval power that it can support may be superseded by a like development in a greater area. Thus Crete was superseded by Greece which, in turn was overtopped by Rome; and thus England superseded the Netherlands as the base of the world's greatest sea-power. In short, we should give careful consideration to the extent of a people's homeland as a politico-economic base from which sea-power may be supported.

It may be well to note in passing that, in a sense, England seems to have over-capitalized the era of her industrial primacy and to have developed about as great sea-power as she is capable of supporting, whereas the incomparably greater base we have in mid-oceanic insular America is just beginning to express itself overseas. While this and other fundamental factors seem to make inevitable the superseding of British maritime primacy by America, it is useless—and even dangerous—to attempt to dodge the fact that this transit of the trident is presenting the world with one of its most delicate questions. If this question be frankly faced, with a wise grasp of the irresistible natural factors and trends involved, well and good. But if desperate efforts continue to be made to stem the overseas expression of such a force as America's economic tide, avoidance of such a result as overtook the Netherlands would seem difficult.

Not only extent of territory under one flag, but its disposition, is of importance. Where there are many considerable units separated by the oceans, as in the British Empire, trade between them stimulates their sea-power. But commensurate open markets, even though under foreign flags, may be equally stimulating to overseas trade and shipping. In contrast to the varied problems and views in such a dispersed aggregation as the British Empire, there are certain advantages in the concentrated extent of the territory of the United States proper as a politico-economic maritime base, provided we obtain adequate overseas markets, assured sources of supplies, and lines of communication reasonably secure under all conditions.

In this connection it is noteworthy that we pushed energetically for "Open Door" treatment between 1830 and 1860, during our first great shipping era, but allowed the policy to slumber while we were engrossed inland; and latterly we have renewed our insistence, in many quarters, on equality of trading opportunities with those of all other countries.

VII. Number of Population

Here again Mahan confined his comments virtually to the more martial aspect of this factor, pointing out that if a large proportion of the population follow callings related to the sea, such as shipbuilding as well as seafaring, they constitute a strong element of sea-power and a valuable reserve back of the organized navy.

It should be realized, however, that the "extent of territory" and the "number of population" are not only relative to each other, but that the actual magnitude of each can have an important influence on the maritime part a nation may play in the world. Historically, meagerness of homeland opportunities drove the Cretans, the Greeks, the Norse, the Venetians, the Portuguese, the Dutch, the English, and the early Americans to overseas trading and seafaring in order to advance their home standard of living. Three hundred years ago it was thought that agrarian England was overcrowded by a population averaging less than one hundred per square mile. Some emigrated. But others took to industry and exported the products of their labor while they remained at home. Now over seven times as many people live in the same area supported in the main by industry and overseas trade with concomitant sea-power; and the beginnings of a similar transformation can be seen in Japan. But in all such instances the size of the population involved and the effective area of the base in and from which they operated were comparatively small.

On the other hand, we have in the United States the unusual combination of vast natural resources, great fluid wealth, and a high industrial development, all at the command of a numerous and enterprising people accustomed to an exceedingly high scale of living. But most of the industries by which we live to an increasing extent are dependent on imports of key crude materials. The maintenance of our standard of living is likewise dependent on our marketing overseas our surplus production. And while England's imports are still greater than ours, our exports exceed hers by over a quarter.

Such factors and actual accomplishments present the prospect of a great people seeking from a commensurately broad base vast overseas trade that will necessitate sea-power on an unprecedented scale—trade and sea-power far beyond the capacity of a much smaller and less well-manned and well-equipped base.

VIII. Character of the People

Of this Mahan says: "The tendency to trade, involving of necessity the production of something to trade with, is the national characteristic most important to the development of sea-power."

He points out that the Iberians had sought above all to exploit their overseas conquests for gold and silver; that the consequent flood of precious metals that poured into Spain and Portugal required little shipping for its transport; and that it undermined such industry as was there instead of fostering it. For the Iberians left it largely to the Dutch and English traders to supply their material wants in exchange for their gold, and thus failed themselves to develop any great volume of production as an enduring foundation for overseas trade, for shipping, or for sea-power.

As to the French, he cites their characteristic of accumulating wealth from sustained industry and hoarding rather than by bold adventure and extensive development in foreign parts; and he shows how their American colonization and later efforts in India were government enterprises rather than spontaneous popular undertakings, a characteristic we can note in present day French colonial efforts. But he concludes that, as such ventures were unnatural to the home-loving French, no solid system of true colonization, of extensive trade, and of enduring sea-power was created.

By contrast, Mahan emphasizes the proclivities of the English and Dutch for extensive seafaring, overseas settlement, development of the resources of overseas lands, and trading, all of which multiplied their shipping and enabled them to develop real sea-power. But while both English and Dutch sea-power were the natural products of these peoples, the early preëminence of the Dutch at sea was evanescent. For their extreme thriftiness denied their shipping adequate naval protection. So England overwhelmed them and became the premier sea-power.

Writing in 1890, Mahan said:

> Before quitting this head of the inquiry, it is well to ask how far the natural character of Americans is fitted to develop a great sea-power

should other circumstances become favorable. It seems scarcely necessary, however, to do more than appeal to a not very distant past to prove that, if legislative hinderances be removed and more remunerative fields of enterprises filled up, the sea-power will not long delay its appearance. The instinct for commerce, bold enterprise in the pursuit of gain, and a keen scent for the trails that lead to it all exist . . . .

British statistics show that, only thirty years before Mahan thus wrote, the British Empire, as a whole, had forty-three per cent of the world's shipping, but England only thirty-five per cent, whereas over thirty-nine per cent of the total was under the American flag. And in this connection it is pertinent to note that, according to our census for 1920, over half our white population is descended from colonial Americans and that only between 1890 and 1920 was our immigration not preponderantly from Northwestern Europe. Naturally, as our internal development has advanced and our need for external trade has recurred, Mahan's prophecy is beginning to be fulfilled; for it would be difficult to name a people better endowed and circumstanced than we are to develop a vast overseas trade.

IX. Character of the Government

Mahan gives us a vivid description of how Colbert deliberately erected the whole structure of sea-power between 1661 and 1671, giving the France of Louis XIV a considerable measure of its prime factors, production, overseas markets, and shipping, and how he capped it with a brilliant navy, designed to wrest the primacy of the seas, and of the overseas world, from England. And then Mahan points out how this whole structure collapsed, first, because colonization, promotive exploitation, and seafaring were alien to the masses of the home-clinging French people; second, because the maintenance of the whole structure consequently depended on persistent support by the royal government; and third, because the latter chose to devote most of its resources to military operations across its frontiers rather than to maritime activities. Over and over again, such was the story of the land-minded French during their century and a quarter of struggle for world leadership against the sea-minded English people and government.

The task of the Dutch government was far easier; for the whole life of the Netherlands centered around maritime trade in which the Dutch were preëminent. But where the French and English governments were lavish in their expenditures for naval purposes, the Dutch so scrimped their navy that it was defeated in the Anglo-Dutch wars and they lost most of their American possessions as well as the premier place in maritime transportation. And later, when in alliance with the English, the Dutch lost to their ally the residue of their maritime greatness because they would not spend enough to keep up their agreed naval quota.

In contrast to such procedures, the English people took naturally to seafaring, colonization, and overseas trading; and after Cromwell's reforms, the English government was conducted by a class that usually recognized the characteristics of the people and led persistently in providing their overseas trade not only with adequate shipping but with a navy almost always strong enough.

This led Mahan to say that "the most brilliant successes have followed where there has been intelligent direction by a government fully imbued with the spirit of the people and conscious of its true general bent." Naturally, such "intelligent direction" must rest on real understanding of both internal and external politico-economic conditions and characteristics; and it must be guided by a clear grasp of the principles and of the full range of practical procedures whereby an energetic and outlooking people may develop and use sea-power commensurate to their needs, abilities, and opportunities.

X. Conclusions

We have seen that North America is, in effect, a great mid-oceanic island, comparable, as an economic unit, to all of Europe west of Russia. In the United States, already an importer of more food than we export, our industrial life depends on imports of essential crude materials. Export sales of our great surplus production, mainly of manufactures, facilitate our import purchases and contribute materially to our prosperity.

The result is an external trade which, in the words of President Coolidge, "is world wide and not exceeded in importance by that of any other country." This accomplishment refutes allegations that we are incompetent to conduct such commerce. Likewise the growing success of privately owned

American shipping conclusively refutes sedulously disseminated propaganda to the effect that we cannot operate shipping.

To students of Mahan's elements of sea-power, as exemplified in America, such results give confidence. For even the foregoing slender outline of those elements indicates how superlatively well endowed we are as to geographic position, conformation and extent of territory, and numbers and character of people. But has our government persistently shown real understanding of the principles and practices whereby such an energetic and outlooking people may secure commensurate expression on the seas? Has our government given our maritime matters such "intelligent direction" as those of some other countries enjoy?

The answer must be negative with respect to former bungling as to American shipping interests, as yet not recognized fallacies of the Washington naval conference of 1921, and past administrative and Congressional indifference to rounding out our fleet in accordance with even the recognized implications of that conference. But the point of view exhibited by others at the Geneva naval conference of 1927 effectively awakened some of our indifferent civilian authorities. The revolutionary result was that the House of Representatives passed a well-considered three-year naval building program by a vote of five to one, a program which assuredly would have been approved by the Senate had it come to a vote instead of being blocked by other legislation so that it remains for Senatorial action at the coming session.

Appreciation of Mahan's elements of sea-power leads, however, to the belief that the popular support of the Jones-White shipping legislation, advocated by the Shipping Board and enacted, is more important, at least as an index, than prompt success of the naval legislation would have been. And this because the sequence in sea-power is production, overseas trade, shipping, and then support by naval power.

Americans are earnest and able producers; our great productive agencies are realizing their increasing dependence on overseas trade; the essential rôle of American shipping is being better understood and consequent popular support is strengthening our shipping power. When the import, to all classes of the community, of these basic and already firmly established factors is more generally recognized, then popular support will sweep aside fallacious fancies and produce naval power commensurate to our needs and capacities rather than in accordance with some evanescent formula or ratio set up in seeming disregard of fundamental principles. For a measure of sea-power that would overtax a limited base may be entirely inadequate for a larger base and population, and much below the latter's capacity to contribute to a common cause.

In this connection, one of the most encouraging developments since the Geneva conference is that some farseeing Englishmen apparently have recognized the overseas capacities and outlook we have in insular America. And they seem to have come to the conclusion that, although the growth of American sea-power might continue to be artificially retarded for a while—with much friction and at the risk of grave consequences—yet it cannot be prevented. As there is even more than America's friendship and support at stake, such a conclusion is wise—even though Admiralty advocates denounce it for decades. It is wise because the expressions of peoples on the seas are ultimately controlled by their respective natural and human conditions and characteristics; and to attempt to do otherwise is to attempt to stem some of the strongest natural forces—with inevitably disastrous results.

The Heart *of the* Navy

By Rear Admiral Frank H. Schofield, *U. S. Navy*

INSCRIBED on the heart of the Navy are the words: "Loyalty, Devotion, Service to National Ideals." Judge the Navy in its every act by this inscription.

Every naval officer who enters the service takes an oath in these terms:

> I do solemnly swear (or affirm) that I will support and defend the Constitution of the United States against all enemies foreign and domestic; that I will bear true faith and allegiance to the same, that I take this obligation freely, without any mental reservation or purpose of evasion; and that I will willingly and faithfully discharge the duties of the office on which I am to enter. So help me God.

This oath becomes the guiding principle of all his subsequent efforts. Its intelligent execution requires of each officer an understanding of his duties under the Constitution. In the preamble of the Constitution we find that the objects of the formation of the government of the United States were "to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common Defence, promote the general Welfare, and secure the Blessings of Liberty to Ourselves and our Posterity. . . . ."

The oath of office and the duties it entails under the Constitution are not idle words in the mind of the naval officer, but rather his life mission. He must devote his entire time to living up to the requirements of that oath and those duties. "To provide for the common defense, to promote the general welfare," are active every-day requirements of his profession. Of course these are very general requirements constituting a general mission. There must be more specific direction of effort if effective results are to be achieved. So the Navy formulates a policy which is published, setting forth in detail the ends to be attained in the furthering of its general mission.

The average naval officer enters the service as a boy and grows up with the service, so it is important in our scheme of organization to provide for his education along the lines which will make him most efficient in the execution of his mission. We emphasize the importance of educating the heart as well as the mind of the officer and man. This particular aim finds expression in our Articles for the Government of the Navy which say, among other things, that "the commanders of all fleets, squadrons, naval stations, and vessels belonging to the Navy are required to show in themselves a good example of virtue, honor, patriotism and subordination." This is a high mission. The service is reminded of it once each month by the public reading of this article to all officers and men. Its monthly repetition results in its becoming engrained in the consciousness of every officer and man of long service in the Navy.

A further stimulus to high conduct and to the realization of the ideals of perfect service is found in our custom, which has now spread from the military service to the public, of rendering formal tribute to the flag whenever it is hoisted on board ship, whenever it is lowered at sunset, or when the flag passes on the street. Each officer and man stands at attention and salutes the emblem of the country to which he owes allegiance. The repetition of this formula of allegiance through the long years of the career of the naval man cannot help but have its influence upon his devotion to the service which claims all the best years of his life.

These appear to be generalities, but their influence on the conduct, zeal, and devotion of the individual is marked.

The naval officers and the enlisted men who make the Navy their life career do so at great personal sacrifices, but they have always as a reward the consciousness of service to the country, which claims and is entitled to their devotion.

The government has seen to it that officers and men are divorced from the necessity of considering self-interest, through an adequate provision of pay, and through retire-

ment arrangements at the end of the individual's career such that he and his family will be provided for during his lifetime. This fact enables each officer and man to determine his conduct by an answer to the question, "Where does duty lie?" and not by an answer to the question, "Where does self-interest lie?"

The naval officer not only believes in his profession but believes that the country by its organization of the military services has bestowed upon itself a great spiritual asset—a group of highly representative Americans divorced from the necessity of considering self-interest and encouraged to devote themselves exclusively to national welfare.

Like every loyal public servant the naval officer and enlisted man desire most of all a secure place in the heart of the public, based upon an appreciation by the public of the Navy's effort to do right and to do well all the time. They feel that the moral support of the public is an essential to complete success in their efforts. They hope for the commendation of the public in what they do and find that commendation chiefly in the attitude of the press of the country, and in the attitude of Congress toward the naval needs of the country. Whether that commendation comes or not they carry on with all the vigor they have in a sustained effort to serve.

The Navy to be successful must cultivate in its personnel, elements of character calculated to produce unity and strength. Chief among all of these characteristics is loyalty —the active service of an understood cause. Loyalty for the Navy is not mere devotion, but intelligent activity in the sustained service of an understood cause. Whatever breaks down organization or tends to a scattering of effort is disloyal in its effects. It is for this reason that the Navy is impatient of any individual who fails in his loyalty to the ideals of the service, ideals that have been developed out of its long experience. No team work, so essential in military operations, can be fully effective unless the individuals of the team are actuated by a devotion that will subordinate personal opinion to the plan and orders of authority. Decision of character, sound initiative, a clear and constant perception of the goal of effort, the will always to strive toward it, are necessary to the naval officer or man who would serve his country well in accomplishing the mission given him in his oath of office and in the laws and regulations governing the service.

The ideal of the Navy is service, but that service to be efficient must find expression in specific accomplishment, in things that must be done in peace as well as in war, in order that the mission for which the Navy is created and maintained shall be surely accomplished. The necessity of preparing in times of peace for efficient service in a time of national emergency brings most of the criticism of the pacifist and similar organizations upon the Navy. The Navy even amidst the most profound peace must give its principal attention to the conditions that it desires most of all to avoid—attention to the requirements of war. A Navy that functions only in time of war and subordinates all activities to pacifist ideas in time of peace, will invariably fail of its defense mission, and will be neglectful of the high duty for which it is created. It is this fact that causes the thoughtless to charge it with being militaristic, when in reality it is seeking only to follow the dictates of duty.

It is not enough for the Navy in time of peace to use what it has and to develop efficiency in the use of what it has. We would be seriously neglectful of our duty if we failed constantly and urgently to recommend through legislative channels the requirements of an efficient Navy in ships, in personnel, in training and in operations in time of peace. Those are duties with which the Navy is particularly charged and on which it is especially qualified to advise.

In making his recommendations the naval officer has in mind not naval needs but national needs. This idea found very concrete expression recently in a hearing before a committee of Congress in which the chief of naval operations was asked if the Navy needed certain cruisers. His reply was, "No, the country needs them." That is the basis of every recommendation made to higher authority, the basis of the *country's* needs and not the Navy's needs. The Navy has no need independent of the country. It is a servant of the country, nothing more and nothing less.

This attitude of having always in mind the country's needs rather than the specific needs of the Navy governs our relationship with the merchant marine. The merchant marine is closely associated with two of the Navy missions contained in the preamble of the Constitution. It assists in providing for the

common defense and assists in promoting the general welfare of the nation. It would be quite natural to suppose that the Navy would direct its influence toward building up a merchant marine especially useful in time of war. This idea has received partial expression in laws now on the statute books, but the Navy in balancing the requirements of general welfare against the requirements of war believes that the merchant marine should be built to meet the peace-time needs of the nation. As to foreign commerce, it is particularly concerned in seeing the flag over merchant ships that make their chief business the carrying of goods to foreign ports and the bringing of goods from those ports to ours. These are generally vessels of moderate speed, ill-adapted to the requirements of war, yet I believe that no naval officer would ever sacrifice the peace time advantages to the country of this class of ships of the merchant marine in order that the faster, more serviceable ships from a war standpoint might be built. We believe that prosperity can be built up best at sea through American transportation facilities for goods of all classes to and from our shores and through the ability effectively to guard these vessels and their cargoes.

There is a popular delusion that naval officers desire war for purposes of personal preferment. Nothing is further from the truth. The naval officer desires above everything that his country remain at peace, and it is only when the country itself expresses its determination for war, through constitutional agencies, that the naval officer enters war with devotion and energy and enthusiasm.

Can anyone believe that the 5,000 marines now operating in the jungles of Nicaragua are there from choice? They are there in obedience to orders—unsolicited, unsought, but received and obeyed with the greatest loyalty. For them there is no promotion incident to the service, no comforts and no emoluments, no reward except the consciousness of duty well performed, duty requiring on their part the highest type of devotion and service to the decisions of their country. They are removed for the most part from the public eye and so do not enjoy the acclaim with which less conspicuous service would be rewarded were their activities nearer home. Not one citizen in a thousand knows the names of the commanding naval officer or the commanding general who are devoting all of their time and effort to the solution of an extremely difficult problem. The subordinate officers and men in positions of great responsibility and danger have even less of public interest to support them in their devotion to service; yet duty, loyalty, the desire to serve, see them through.

Peace is what the Navy wants all the time, but the kind of peace that guards the interests of their country. They know that the civil government will be watchful of that, and that their duty is to assist in that high aim.

As specific examples of the Navy's desire to promote peace, I will cite one or two instances. Some years ago our fleet visited a great foreign city. One of the men in a crowded public square during a band concert, jostled a woman so that she fell and broke her collar bone—a very regrettable incident, and one that might have been magnified into a situation highly injurious to the friendly relations then existing. The problem for the officer in command was how to turn the incident into one that would make the relations still more cordial. As soon as he heard of the incident he loaded a taxicab with flowers and went to the home of the injured woman. Later he sent his aide with another generous contribution of flowers. When the incident became known to the fleet, the officers and men contributed a purse of $3,000 as an expression of their regret and of their friendship. The reaction to the manner in which the incident was handled resulted in an accentuation of the friendship for the officers and men of the fleet and through them for the country which they represented.

On another occasion a cruiser was sent to assist in the solution of a civil war in a small republic. During the four months of its presence in the disturbed area, that cruiser established friendly relations with both contesting parties, and through its efforts was able to restore peace with justice. Its success was chiefly brought about through the sympathetic understanding of the real problem involved and through untiring efforts to adjust the difficulty. The commanding officer had no thought of war as the desirable solution, but rather throughout the negotiations the thought of justice and equity to guide him.

It is an anomaly that in time of peace the visit of vessels of war of one country to another is always a gesture of friendship.

These occasions are always made use of by naval officers and by the men of the Navy to strengthen the bonds of international friendship. Sometimes in these visits unexpected and difficult situations arise requiring prompt tact and sound judgment. On a visit of a large detachment of our fleet some years ago to a great foreign city, the mayor, in welcoming the officers and men at a public reception, stated that they were welcome provided there was nothing in the visit of sinister import to any other friendly nation. The American naval officer immediately replied to the effect that the visit was a gesture of friendship, and that it contained no element whatever of hostile import to any other country on the face of the globe; moreover, that it was the hope, the ardent wish not only of the officers and men of that fleet, but of the country which they represented, that if any special waves of friendship were developed by the visit, they would spread from that focus to the farthermost shores of the most distant seas.

Our vessels cruising in distant seas always have in mind the question of how best they can increase the feeling of esteem and friendship between their own and foreign countries.

Two squadrons of destroyers approaching a small village in the South Seas sent a radiogram that they would pass at a certain time. The whole village turned out to see them. When the destroyers arrived near the village they maneuvered close in to shore in order that the villagers might have the rare opportunity of seeing these interesting vessels. These same squadrons were to pass another village about eleven o'clock at night. A message was sent giving the hour of passing and saying that there would be a searchlight display. At the appointed hour over fifty searchlights were turned on the sky and on the shore and kept on for an hour, making a most inspiring exhibit. The reaction of the people and of the press of the island to these attentions was all that could be desired; it was later accentuated by a visit to the principal city of the island. On that visit the officers and men of the squadrons concentrated their attention on the children, the forenoon of each day being set aside for them. Thousands of children visited the ships and were shown everything. These incidents indicate the spirit and the heart of the Navy directed toward the establishment and maintenance of a friendship of the world for America. They are typical, not exceptional.

The more spectacular instances of the devotion of the Navy to humanity are well known and need only to be mentioned here. Burning Smyrna, earthquake-stricken Sicily, Japan, Jamaica, San Francisco, all brought out the highest qualities of the head and heart of the Navy. When assistance was rendered in foreign ports, the Navy made it a point to stay only so long as their services were valuable and not to stay for purposes of observation or of curiosity—to do what they could and then to leave.

The principal point of difference between the Navy and its attitude toward peace and the honest pacifist and his attitude toward peace is one of method. The Navy believes that peace with justice can best be attained through trusting in the integrity of intention of our own country. The pacifist desires to see us weak, believing that this weakness will guarantee peace. The naval officer believes in seeing us strong, believing that strength is the best guardian of peace, and that since in international affairs we must trust some one, we can best trust the government of the United States.

The Navy believes that to be strong is not to be warlike, but rather to be effective defenders of righteous peace. It believes, in the words of the President, that "after all, peace is a spiritual attainment. We can set up material safeguards like fortifications and armaments, which will afford us much protection against attack, but unless we cultivate sentiments of friendship and understanding they are no guarantee of peace." This idea dominates all the international acts of the Navy during the period of peace.

The foreign propagandist interested in keeping our Navy weak makes use of slogans and epithets which are widely copied in the press. If we want cruisers of a certain type, they say that these cruisers are *offensive* cruisers; that the cruisers they propose are *defensive* cruisers. These statements are false, but because of their wide use and because of their reiteration they are accepted by many whose knowledge of the Navy and naval requirements must be incomplete. We are told that our country wants a Navy for *prestige;* that our need for a Navy is not so great as the need of other powers. The statement that we need a Navy for *prestige* is also false, and is known to be false, by those who put it

forward. They make no attempt to demonstrate even a shadow of truth in the statement, but seek through reiteration and through wide publicity, to establish the false idea in the minds of the American public. The naval officer on the other hand knows that a strong Navy is a stabilizer of world conditions; that the more highly organized the world becomes the more necessary it is that that organization be stabilized by international agreement, and not through the exercise of the superior power of one nation only. The welfare of each individual of our country is intimately associated with and dependent upon the equitable operation of world organization. There can be no guarantee of such a condition that is not based upon the power to enforce a just consideration of our commercial place in the world.

A systematic foreign propaganda has been directed against the soundness of the opinions of American delegates and American naval officers, seeking to discredit those opinions when they ran counter to foreign desires. This propaganda has gone so far as to take the form of an actual public attack by a foreign minister on the capacity and knowledge and fitness for negotiations of our American delegates to the Geneva Conference. This attack was based not really upon the incapacity of those delegates, but on the foreign recognition of the fact that those delegates were competent but were not subservient. It is not to be expected that a great body of public servants such as those constituting the naval profession, can read these statements of foreigners circulating in our press, sometimes with approval, without resenting them and without desiring to find some way of presenting the truth to our compatriots. The gist of foreign naval propaganda may be summed up in the following words: "Disarmament for us, but preparation for them."

Officers of the Navy are frequently presented with problems in which the honor and dignity of their country are involved. These problems often require prompt decision without reference to higher authority. The naval officer must keep himself constantly in touch with the policies of his government, with international customs and practice, in order that he may bring credit to his country and create no incidents that will produce unfavorable reactions. The following incidents are illustrative of these problems.

In 1915, before the United States entered the World War, an American cruiser on the high seas was approached by a cruiser of one of the powers at war with a signal flying, "Stop instantly." Should that cruiser have stopped or should it have proceeded on its way?

In the same year a United States cruiser visited a port of one of the powers at war for the purpose of obtaining fuel. Fuel was available in that port. The next nearest port where the cruiser could obtain fuel was 900 miles away. The cruiser was met off the port by a boarding officer who informed the captain that the cruiser could not enter the port unless the local authorities were allowed to seal the radio room of the cruiser. This was a new and unexpected requirement on the part of the belligerent power, one not in accord with international practice. A cruiser, even in a foreign port, is United States territory, upon which the sovereignty of the United States is still operative. Should the captain have permitted the sealing of his radio room or should he have accepted the voyage of 900 miles to the next fueling station?

On March 24, 1927, a group of Americans and Europeans had been driven by marauding and unorganized Chinese troops from their homes and places of business to a house on a hill on the outskirts of Nanking, where they were cut off from aid or from means of escape to ships. The killing of Europeans had begun; every argument, every conciliatory proposal, every possible patience had been exercised by these refugees and by our ships in the harbor in seeking to avoid the necessity for the use of force in defending their lives. What should the American ships present in that harbor have done?

These incidents are only typical of those that arise constantly in the life of the naval officer and demand of his educated heart and head sound solution in consonance with the dignity, the spirit, and the duties of the country which he represents.

While the Navy has always the mission of peace, it has also the mission of readiness for national emergency—war. In our own ports the public comes in contact with the Navy chiefly during its so-called holidays, when ships are thrown open to public inspection and visitors by the hundreds and thou-

sands are received on board. The impression is gained on these occasions that the Navy is not very active, because on the days when the ships may be inspected, the Navy is not actually at work; but I can truthfully say that there is no harder worked governmental organization in our country than the Navy. The schedules of fleet employment provide six months in advance for what each ship of the fleet is to do on every day. The execution of these schedules requires constant cruising, maneuvers and target practice of all kinds, both night and day. Each individual finds his time fully occupied.

Naval training is essentially a training in movement, and movement of large numbers of ships requires the greatest possible cooperation of the team, in order that correct results may be achieved and disaster may be avoided. The tactical exercises of the fleet are always dangerous. One cannot train a navy for war without taking great risks. Night maneuvers are especially dangerous, since during these maneuvers ships must operate without lights. One can imagine the feeling of great responsibility incident to the command of a large group of ships racing through the night to discover the opposing fleet, and having discovered it, to deliver its attack without fail and without accident. I have participated in numerous maneuvers of this character. In subsequent interviews the captains of my command have invariably told me of hairbreadth escapes, of tactical problems presented and successfully solved. It is to the credit of the Navy that no major accident has ever occurred during these maneuvers.

Some idea of the feeling of responsibility that rests upon the shoulders of the senior officers of the fleet during these maneuvers may be gathered from the fact that the normal peace-time maneuver involves the movement of from 50 to 100 ships in a comparatively limited area; that these ships carry upwards of 30,000 officers and men; that their cost to the country runs into the hundreds of millions of dollars, and that inefficiency in their use may cost the country in a single day or a single night many lives and many millions of dollars.

Within each ship the duties of subordinate officers and men are equally dangerous and highly responsible; if any individual fails properly to perform his duties it may mean disaster for the ship in such exercises as target practice, torpedo practice, and mining practice. The public notes with interest that a great battleship may fire three salvos of 16-inch shells from its turrets at a target fifteen miles away in one minute of time and hit that target, but they have very little conception of the weeks and months of training required to produce that efficiency with safety. No man may fail in his job, if such results are to be achieved.

The airplane must be shot from the battleship's catapult; its pilot and an observer must perform their duties where seconds of time are measures of efficiency. If they are slow or unreliable in their observation and in their radio communication, they fail of their mission, and the ship's gunfire becomes ineffective. Every officer and man on the ship must perform his duties with clock-like precision or the rate of fire of his ship will become slow and inefficient. The fireman and the engineer must be equally alert if the ship is to succeed.

The Navy measures its tactical and strategic efficiency by the actual results it attains. These are carefully recorded day by day and year by year, so that the whole service knows who is the most efficient and who is not. This stimulus of competition to effort is present in the Navy through each day of the year. It takes the place of the dollar measure of efficiency in civil life, and has always as its underlying motive the spirit of readiness of the Navy for its high mission of preserving through its strength the peace, or if peace be broken, of restoring it with honor to the country.

It seems to me that a more sympathetic public attitude toward our Navy would result if the press and the public could be thoroughly imbued with the idea that the Navy is the country's Navy, that it is not "The Navy" but "Our Navy." Ownership stimulates interest. The naval profession never regards our Navy in the light of Navy ownership, but in the light of a service belonging to the public. It regards its whole organization and material as a public institution owned and operated by and for the public. It desires to be known by that public as "Our Navy." It desires that the public judge our Navy by its motives and by its acts interpreted on the background of those motives.

Progress *in* Naval Aviation

By Rear Admiral W. A. Moffett, *U. S. Navy*
Chief of the Bureau of Aeronautics

WHEN Congress authorized the five year building program for naval aviation in 1926, the Navy had 351 serviceable airplanes on hand. The program is now well under way. On July 1, 1927, there were 468, and on July 1, 1928, 624 airplanes in service in the Navy. The building program provided for 1,000 airplanes to be built over a period of five years. Three years remain to complete it. This wise provision of Congress has enabled the Navy to replace its obsolete aircraft with planes of the most modern type and to provide the additional planes necessary to meet the increasing requirements of the fleet. Naval aviation activities since the aircraft carriers *Lexington* and *Saratoga* joined the flag have been greatly extended. The fleet air squadrons work under three general categories: those which work from the carriers; those which work from the battleships and cruisers; and those which are not carried aboard ships but which work from the water, accompanied by seagoing tenders, which quarter the crews, and which carry the supplies and workshops necessary to maintain the planes during extended cruising.

To meet all the requirements of naval aviation the designer is confronted with problems which do not arise in the design of other types of military or commercial aircraft. The highest standards of performance, speed, maneuverability, climb, reliability, and all other characteristics of military aircraft, are essential. In addition to these requirements naval aircraft must be designed for practical use with the fleet, under conditions of service that are entirely different from those found in other forms of aviation activities. When aircraft are being catapulted into the air from the decks of battleships and cruisers at sea, or when alighting on the decks of aircraft carriers where the landing space is not one-tenth of the area of the ordinary landing field ashore, or when working on the water under average service conditions, they are subject to stresses which call for unusual features of design. Great credit is due to the designers and engineers who have successfully solved these problems.

Naval aviation has passed the critical stage and is now firmly established as a practical part of the fleet. No great stretch of imagination has been necessary to foresee the possibilities of aviation, but it has required patience, perseverance and engineering skill of the highest order to develop aviation to the point where it could be applied practically to uses with the fleet at sea.

Most of us have forgotten that Mr. Eugene Ely, in November, 1910, made the first airplane flight from a ship. He flew a fifty horse-power Curtiss land plane from a platform built on the bow of the U.S.S. *Birmingham* anchored at Hampton Roads, Va. In 1911 he made a successful landing on the deck of the U.S.S. *Pennsylvania* lying in San Francisco harbor. But air activities from ships at sea were not practical until the successful development of the catapult and the airplane carrier. The Navy previously had been confined to its work with airplanes operating along the coast from naval air stations or in conjunction with seagoing tenders.

During the antisubmarine campaign in the war, the patrol type of airplane, sometimes called flying boat, was used extensively by the Navy. It was in one of this type, the *NC-4*, weighing 28,000 pounds, equipped with four motors and carrying five persons, including the radio operator, that Lieutenant Commander A. C. Read, U. S. Navy, in 1919 made a non-stop flight from Newfoundland to the Azores. It is worth noting that this was the first successful transatlantic flight. Many persons believe that the recent brilliant flight by Colonel Lindbergh

from New York to Paris was the first flight across the ocean. Lindbergh was also preceded by Hawker and Brown, who flew a land plane from Newfoundland to Ireland shortly after Read's flight. Miss Earhart's flight from Newfoundland to England was the second flight to be made across the Atlantic by a seaplane. The newspapers are carrying headlines of attempted seaplane flights from the Azores to the United States, but these have not yet materialized (Aug. 3, 1928).

AVIATION RECORDS HELD BY UNITED STATES NAVY SINCE 1926

(*World Records*)

Record	*Plane*	*Date*
Altitude	*Apache* (landplane)	July 25, 1927

Seaplanes (returning to point of departure without refueling)

Duration	*PN-12*	May 3, 4, 5, 1928
Distance	*PN-10*	August 15-16, 1927
Altitude	*Apache*	July 4, 1927
Speed (for 1000 km.)	*Corsair*	May 21, 1927

Seaplanes with useful load of 500 kg. (returning to point of departure)

Duration	*PN-10*	August 15-16, 1927
Distance	*PN-10*	August 15-16, 1927
Altitude	*Corsair*	April 14, 1927
Speed (for 100 km.)	*Corsair*	April 23, 1927
Speed (for 500 km.)	*Corsair*	April 30, 1927

Seaplanes with useful load of 1000 kg. (returning to point of departure)

*Duration	*PN-12*	May 25, 26, 1928
*Distance	*PN-12*	July 11, 12, 1928
*Altitude	*PN-12*	June 27, 1928
*Speed (for 2000 km.)	*PN-12*	July 11, 12, 1928

Seaplanes with useful load of 2,000 kg. (returning to point of departure)

*Duration	*PN-12*	July 11, 12, 1928
*Distance	*PN-12*	July 11, 12, 1928
*Speed (for 2000 km.)	*PN-12*	July 11, 12, 1928

*Have not yet been authenticated by the F. A. I.

Commander Byrd's flight over the North Pole and his Arctic explorations, and the long distance flights over land and sea by American and European aviators have been notable achievements. Though not directly related to naval aviation, these flights and the record-breaking performances in speed, altitude, weight carrying and endurance show the progress that aviation is making from year to year. They also foster public interest in aviation and stimulate developments in the art. Incidentally, since 1926, fifteen of these world records have been established by our naval airplanes of the purely service type. These records were made in connection with experiments to determine the amount of fuel and military load which could be carried on naval missions.

The Navy is now operating from ships at sea, in the neighborhood of 225 airplanes of all types. Bombing, torpedo, scouting, observation, and fighting planes are carried on the *Langley*, *Lexington* and *Saratoga*. Observation planes and fighting planes are working from catapults on board battleships, and each light cruiser carries two observation planes on its catapult. The development of catapults for use on board ship has gone hand in hand with the developments along other lines of naval aviation. When the five-year building program was authorized in 1926 there were thirty-two catapults on battleships and cruisers and one on the aircraft carrier *Langley*. Since then eleven more catapults have been installed on battleships and one on each of the carriers *Lexington* and *Saratoga*.

The air-cooled motor has contributed greatly to the success of aviation activities on board ship. The water-cooled motors built during and subsequent to the war weighed about 2.2 pounds per horse-power, and were too heavy for shipboard planes carrying military loads. The Navy Department, consequently, encouraged the development of the air-cooled motor, in which the weight has been reduced to 1.43 pounds per horse power. By the elimination of water, radiator, piping, and other changes, fewer spare parts are necessary, which simplifies the problems of maintenance afloat. The elimination of the radiators and water piping also has lessened the vulnerability of aircraft to gunfire. Saving in weight has resulted where metal construction has replaced wood and wire, besides giving a greater degree of safety and less chance of serious personal injury in case of accident. Improved landing gear to absorb shocks in landing, the development of a light, reliable self-starter, and other improvements in the design of material have facilitated the work of the aviator on board ship. Improved designs of flotation have been secured for work on the water, and better instruments

have resulted in more accurate navigation, more reliable communications, and higher scores in bombing.

Of equal importance to the development of aviation material has been the development of personnel. To keep pace with the annual increase in planes, the facilities at Pensacola for the training of aviators have been doubled. In 1925 a ground school course in aviation was added to the curriculum at the Naval Academy. This was extended to one month's training in practical work with aircraft at Annapolis immediately after graduation from the Naval Academy. These officers are then sent to general service in ships of the fleet at sea for two years. During this period of two years' service at sea, they are sent to the air stations at Hampton Roads or San Diego for a month's practical course in flying. Upon the completion of the two years' sea service a selected number of the officers are sent to Pensacola for the regular flight course of forty-two weeks, which includes every phase of aviation except work in the fleet. Those who complete this course satisfactorily become qualified naval aviators and are assigned to aviation duty in the fleet.

Since the naval air station at Pensacola was first established in 1914 it has trained over thirty-four hundred pilots. It is the principal aviation training school in the Navy and all officers and enlisted pilots must complete their training there.

Two rigid airships were authorized in the five-year building program. They are to be of approximately 6,500,000 cubic feet as compared with the 2,777,000 cubic feet of the *Los Angeles,* which was acquired from Germany after the war as part of the reparations agreement of the peace treaty. The *Los Angeles* has been used only for experimental work, and for training personnel, as the treaty stipulated that she could not be used for military purposes. Experience gained with her has resulted in improvements in handling gear and mooring masts, reducing the number of men required to handle her on the ground, and the cost of operations. New materials to take the place of gold-beater's skin are being developed, and improved manufacturing processes have greatly reduced the cost of gas cells. The new dirigibles will have better stream-lined forms and controls than the *Los Angeles.* Improvements in the details of the design of structure promise greater strength to meet service conditions. The increase in size, combined with the above improvements, will result in greater all-around efficiency of the new ships. They will be valuable additions to the Navy.

The *Saratoga* and *Lexington* have helped greatly to increase the air strength of the Navy. These ships were designed as battle cruisers and were about half finished when the Limitation of Armament Treaty was agreed to. To avoid scrapping them they were converted into airplane carriers at a saving of several million dollars. They are of 33,000-tons standard displacement and are larger than necessary. Smaller ships would have answered the needs of the Navy better because, under the limited tonnage allowed, we could have a larger number of small carriers, which is preferable to a smaller number of large carriers. We need more carriers, and good ones can be built of half the displacement of the *Lexington.* It was hoped that Congress would authorize one carrier of about 14,000 tons this year, but the bill did not pass.

Each type of aircraft used in the Navy has been created for a definite purpose. No one type of aircraft can possibly combine in itself all the good qualities of the other types, but each must possess the best qualities possible for its purposes. There must be a careful balancing of types and of numbers, therefore, to meet all the material needs of the Navy. That the material be well designed and well constructed is one of the great essentials; that the personnel be skilled in its use is the other. These two essentials go hand in hand.

The Navy is a great machine composed of many elements. Whether these elements be acting separately on independent minor missions or acting together in a combined and coördinated effort of the whole, success or failure will depend upon the qualities that have been developed in the material and personnel. If the highest standards are maintained, the Navy can be depended upon to perform successfully whatever missions it may be called upon to do in peace or war.

Copyright by General Electric Company. From a painting by Mr. Walter L. Greene

U.S.S. SARATOGA

Courtesy Bureau of Aeronautics, Navy Department

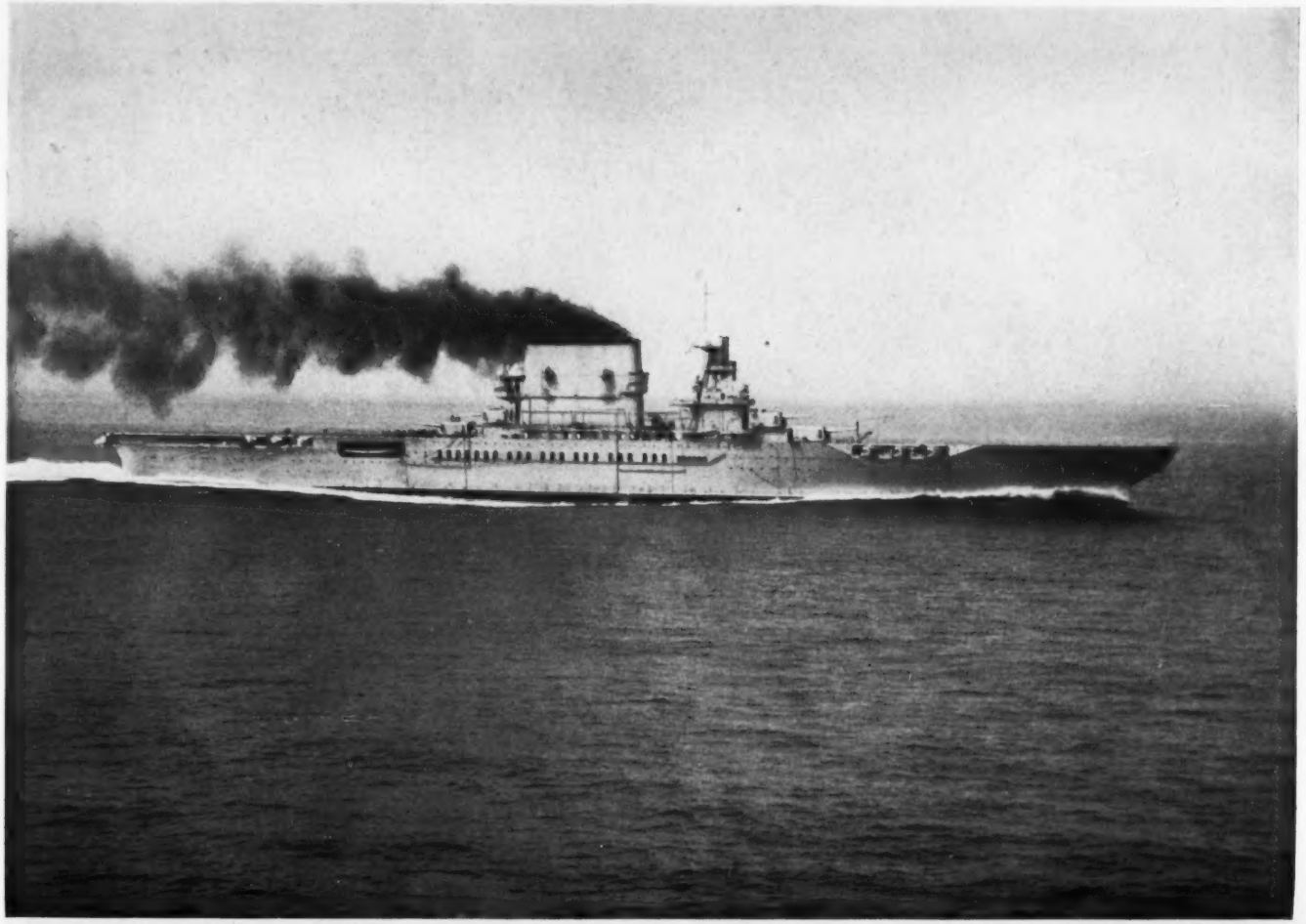
TORPEDO PLANES BEFORE TAKING OFF

Courtesy Bureau of Aeronautics, Navy Department

TORPEDO PLANES BEFORE TAKING OFF

Courtesy Bureau of Aeronautics, Navy Department

TORPEDO PLANES IN VEE FORMATION

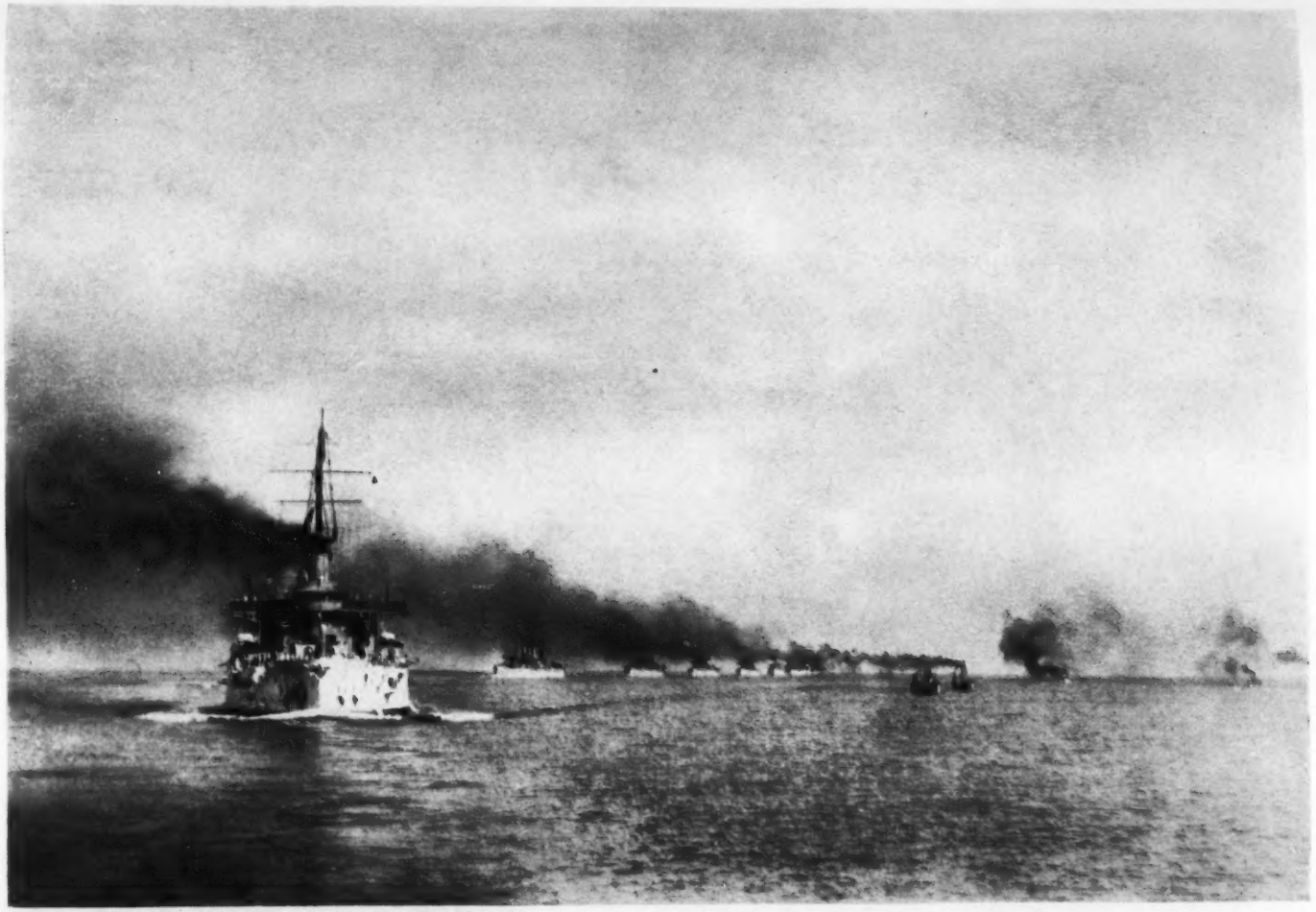


Courtesy Bureau of Aeronautics, Navy Department

U.S.S. *SARATOGA* ON SPEED RUN

Courtesy Bureau of Aeronautics, Navy Department

U.S.S. SARATOGA ON SPEED RUN



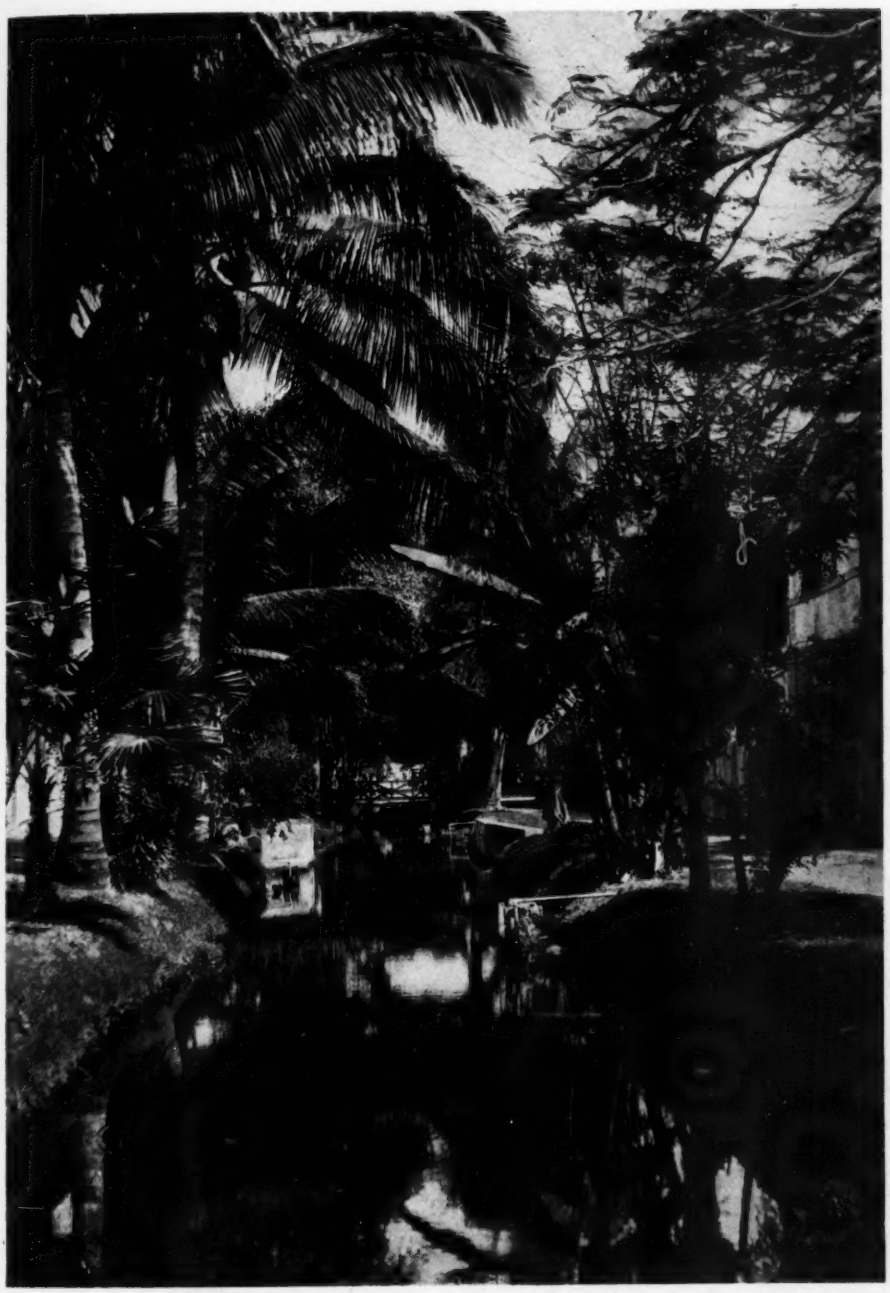
Courtesy Lieutenant Commander R. Wainwright, U. S. Navy (Retired)

PASSING ZAMBOANGA, PHILIPPINE ISLANDS, SEPTEMBER, 1908

After leaving Albany, Australia, the fleet steamed north to Manila. The small craft, near the battleships, were filled with the families of Army officers and men, stationed at Zamboanga.

Courtesy Rear Admiral S. E. W. Kittelle, U.S. Navy

FORT SAN FELIPE
Navy Yard, Cavite, Philippine Islands.



FORT SAN FELIPE
Navy Yard, Cavite, Philippine Islands.

Courtesy Rear Admiral S. E. W. Kittelle, U.S. Navy

Courtesy of Mrs. H. A. Baldridge

A BEAUTIFUL VIEW IN THE PHILIPPINE ISLANDS

The canal in the grounds of the old Spanish fort at Zamboanga, Mindanao, Philippine Islands. The fort was used by our Army as a post after the Spanish-American War. Zamboanga faces on Basilan Straits, through which the battle fleet passed from the Celebes Sea to the Sulu Sea, on its passage from Albany, Western Australia, to Manila in the late summer of 1908.

Courtesy Rear Admiral S. E. W. Kittelle, U.S. Navy

A VIEW OF THE CAVITE YARD

General view from yard water tower, looking towards coaling plant, Sangley Point.

Courtesy Rear Admira lS. E. W. Kittelle, U.S. Navy

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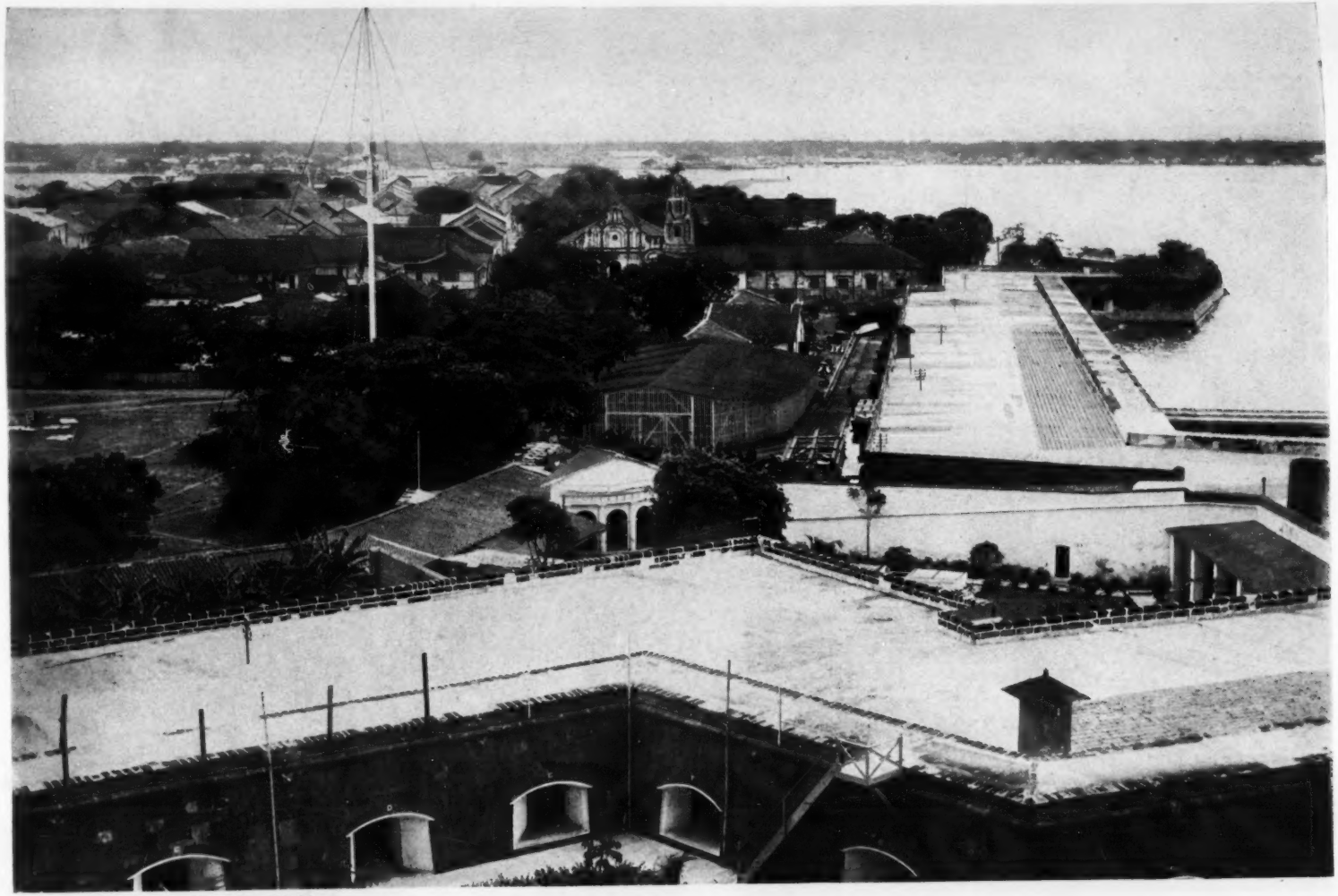
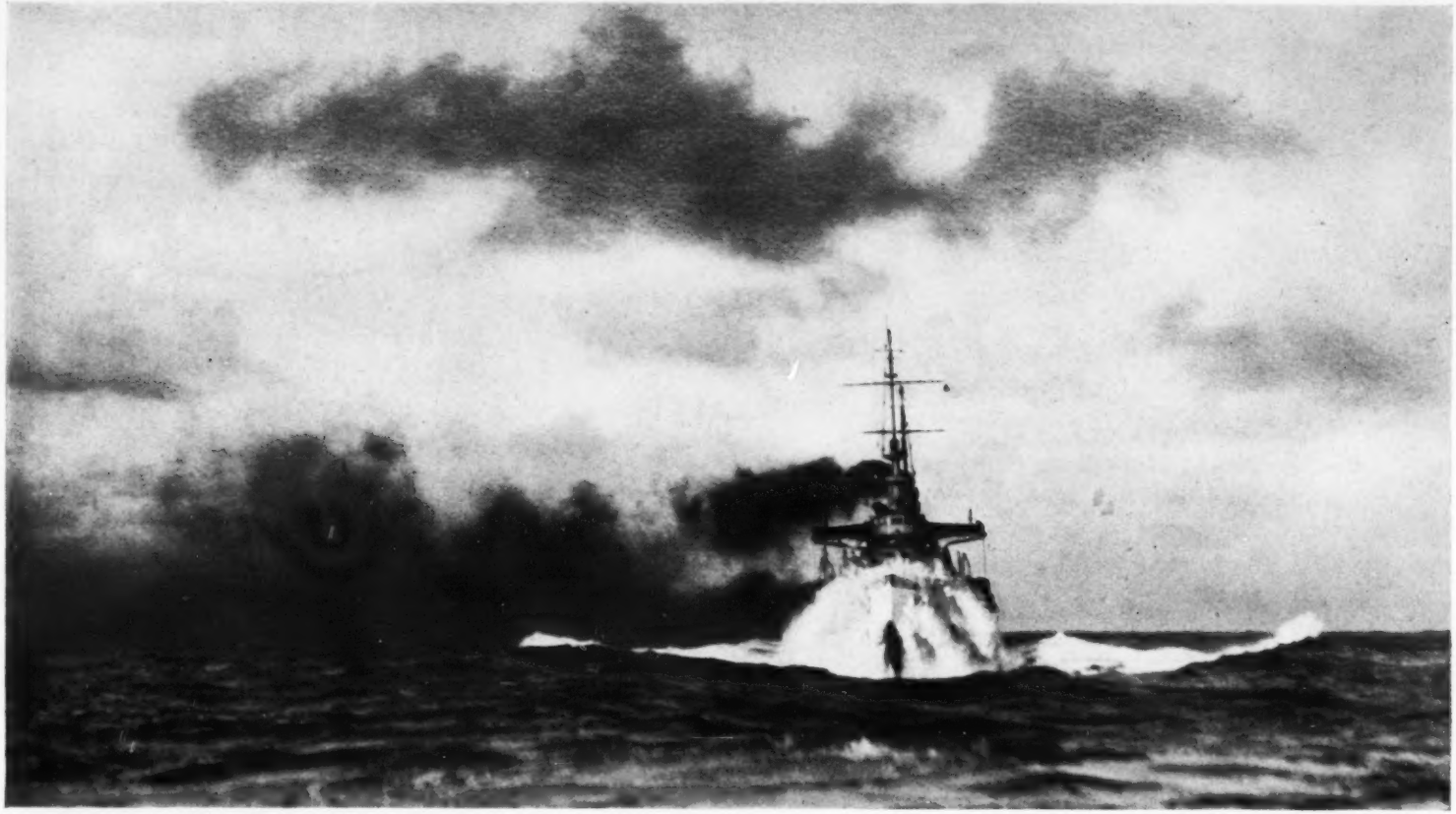
General view from yard water tower, looking towards coaling plant, Sangley Point.



Courtesy Rear Admiral S. E. W. Kittelle, U.S. Navy

ANOTHER VIEW OF CAVITE, PHILIPPINE ISLANDS

General view from navy yard water tower, showing northwest portion of yard and part of city of Cavite and San Roque.



Courtesy Underwood and Underwood

HEAVY GOING

A view of one of the battleships ploughing through a sea during a typhoon, on the cruise to Japan in 1908.

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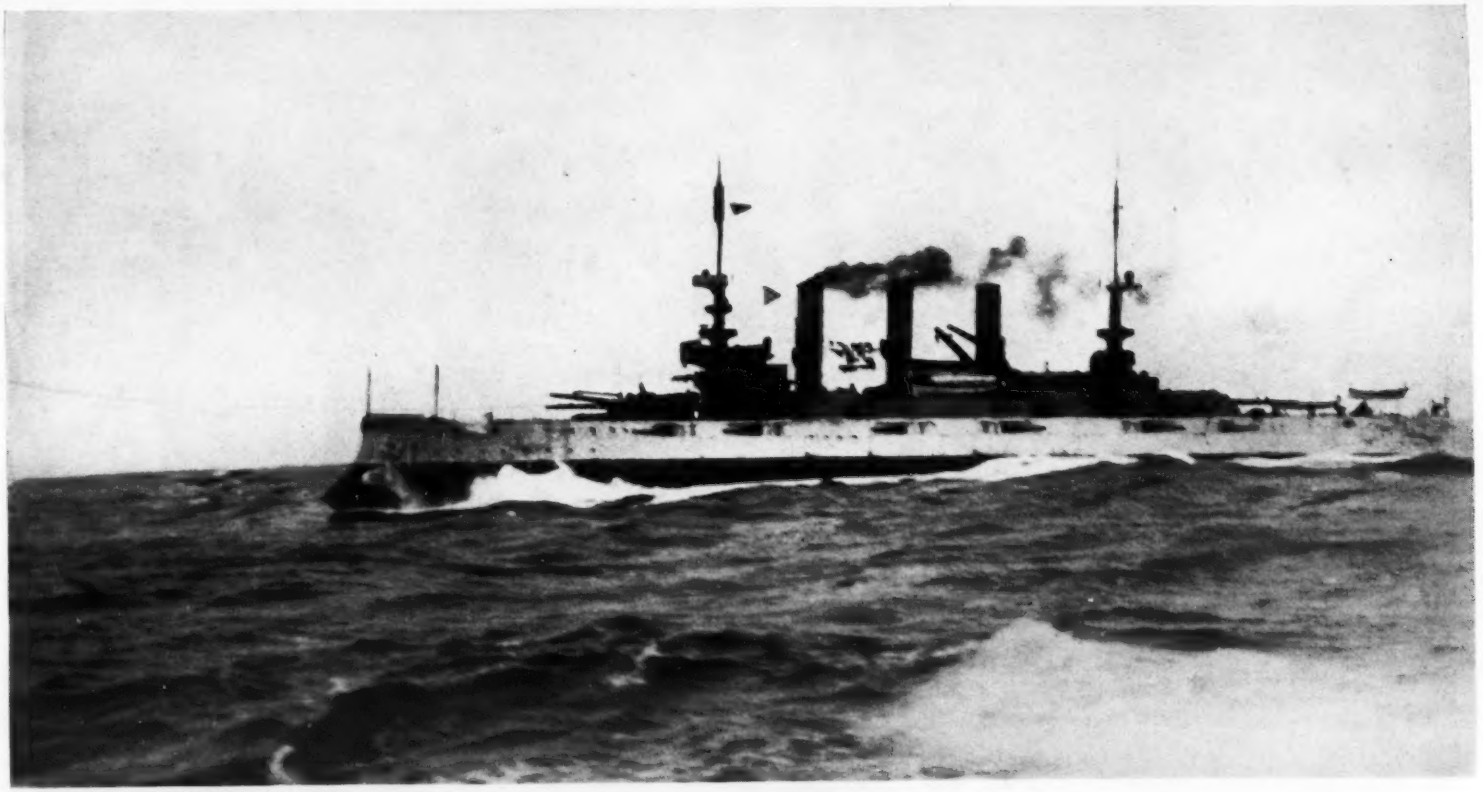

Courtesy Underwood and Underwood

U.S.S. *MINNESOTA*
Doing stunts on the cruise, 1908

Courtesy Naval Records and Library, Navy Department

SEVENTY-FIVE YEARS AGO

Commodore Perry's fleet in 1853. A copy of this old print was made by Mr. Renjo Shimo Oka and presented to Admiral Sperry by the America's Friend Association, Tokyo, Japan.

Courtesy Naval Records and Library, Navy Department

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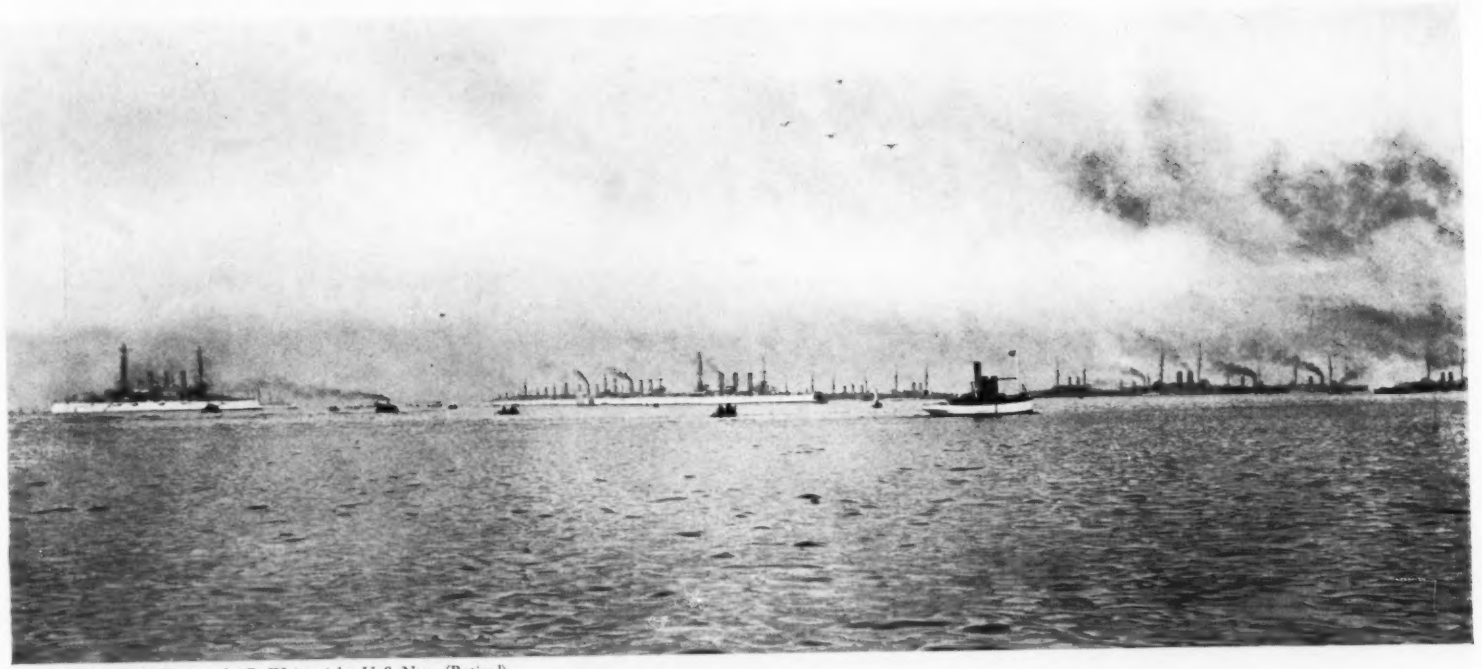


Courtesy Lieutenant Commander R. Wainwright, U. S. Navy (Retired)

TWENTY YEARS AGO

The combined Japanese and United States fleets at anchor, Yokohama, Japan, October 18, 1908.

Courtesy Underwood and Underwood

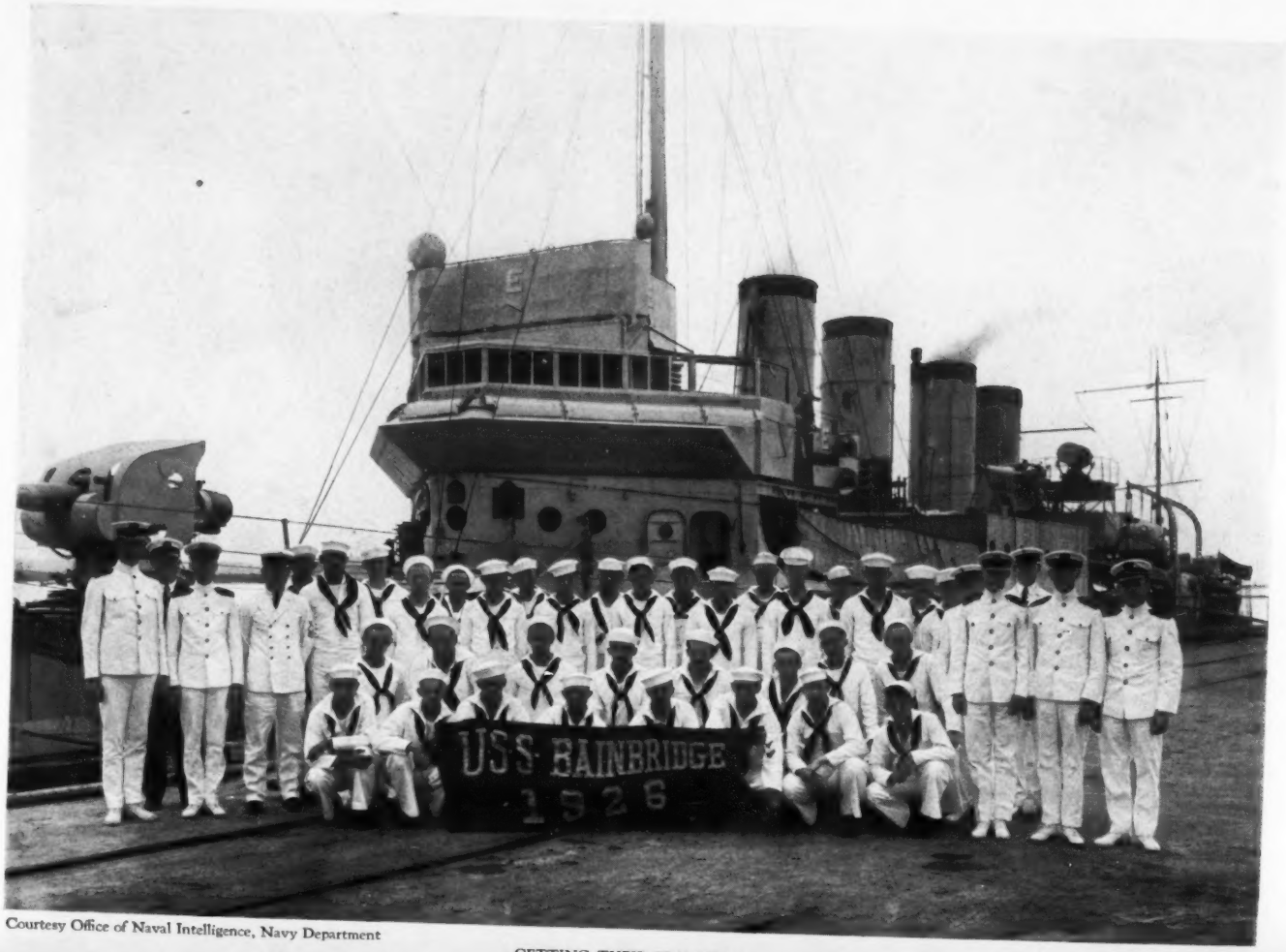
ARCH OF WELCOME
Gateway of welcome to U.S. fleet, Tokyo, Japan. 1908.

Courtesy Underwood and Underwood

ARCH OF WELCOME
Gateway of welcome to U.S. fleet, Tokyo, Japan. 1908.

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy Retired)

REAR ADMIRAL SPERRY LANDS
Yokohama, Japan, 1908.



Courtesy Office of Naval Intelligence, Navy Department

GETTING THEIR SEA LEGS
Naval reserve crew of the U.S.S. *Bainbridge*, cruise of 1926.

Development *of the* U. S. Naval Reserve *by the* Bureau *of* Navigation

By CAPTAIN C. R. TRAIN, *U. S. Navy*

Recently of the Naval Reserve Personnel Division, Bureau of Navigation

AFTER several years of intimate association with the naval reserve, two factors stand out predominantly in its successful development—community support and regular Navy support—in other words a sympathetic understanding by the regular service. Morale whetted by the support of the community is beyond the Navy's control, but a sympathetic interest and understanding given to the naval reserve by the regular Navy is entirely in our hands. That support the bureau of navigation earnestly seeks.

Appreciation of the reserves, naturally, can only be an outcome of actual contact. More and more each year as contacts increase, old differences are wiped out and the appreciation that this civilian navy is a potential asset results.

When we of the regular Navy stop and consider just what the reservist is and under what handicap he works, we cannot help but give appreciative support. To jump from a civilian vocation to the deck of a destroyer for fifteen days' training is no mean leap, harassed as it may be by the worries of civil business. Therefore, we ask the support of the service for this fine branch of the regular Navy, in its work of preparedness for the accomplishment of its mission.

In 1924, the Navy Department awakened to the realization that something had to be done to create a reserve force for the Navy on a sound and lasting basis. Thus in 1925, the Naval Reserve Act was passed which provided an effective naval reserve for the expansion and operation of the United States fleet and naval transportation service. This law became effective July 1, of that year, and it is interesting to note that the naval reserve, as a result of this legislation, became for the first time a component part of the regular Navy.

Although a component part, there is one fundamental difference between the two. While the personnel of the regular Navy is in all respects subject to administration and discipline during the period of enlistment, the control by the Navy of the naval reserve is much more limited. This fact alone requires special handling on the part of the Navy. One must remember that reserve organizations are built up by individuals in civil life having civil employment. Their work for the Navy must of necessity be done at night (except when they go on training cruises), after their own day's work is over. It requires an unusual interest and spirit to bring the reserves down to an armory at eight o'clock at night after a long day in a factory or elsewhere. Once this interest is allowed to lag, the entire organization falls behind, and to offset this the backing of the community is most essential.

During many months of inspection work among the reserves, the writer was particularly struck by the influence that community interest had on organizations. In nearly every case the organization that was in close touch with, and backed by the city officials, the chamber of commerce, the Rotary, Kiwanis, and Lion's Clubs, led the way in efficiency and development.

The act of 1925 created three branches of the naval reserve; the fleet reserve, divided between general service and aviation; the volunteer reserve, and the merchant marine reserve. These branches of the reserve have each their own mission. For example, the mission of the fleet reserve is to create trained organizations for the United States fleet and transportation service. The mission of the volunteer reserve

GETTING THEIR SEA LEGS
Naval reserve crew of the U.S.S. *Bainbridge*, cruise of 1926.
Courtesy Office of Naval Intelligence, Navy Department

is to provide additional trained personnel for afloat and ashore, and the mission of the merchant marine naval reserve is to provide trained officers and men for the transportation and auxiliary service.

The providing of these missions gave the necessary stimulus to the reserve, and a definite goal for each organization. Having assigned them their mission, it is the duty of the bureau of navigation to perfect the administration and machinery to enable the organizations and individuals to successfully meet the requirements.

Soon after the establishment of the missions, the Department assigned to each division of the fleet reserve a definite ship to be commissioned by that division upon mobilization, also a great step in advance.

The seagoing fleet divisions are 149 in number, situated in eighty-seven cities all over the United States; 110 of these are assigned to individual destroyers now out of commission in Philadelphia, San Diego, and Honolulu; while thirty-nine divisions make up crews of certain specified repair ships, destroyer tenders and tankers. The crew of one of these destroyers will consist of a fleet division supplemented by a nucleus crew from the active boats and reservists of classes F-2, 3, and 4; in other words, the four-, sixteen-, and twenty-year men. The total fleet reserve at this time consists of 9,000 F-1 men, 10,000 F-2, 3, and 4 men, and 1,100 officers.

The enlisted personnel making up the fleet division consists primarily of F-1 men. These men are recruited for the reserve just as we recruit men for the regular service, except that they must belong to the community in which the division is organized, and there must be a vacancy therein. They are absolutely green, except a few who come in by transfer from the volunteer reserve. They are required to drill once a week, for which they receive one day's pay of their rating.

The officers likewise must come from the community, and must reside there. Nearly all of them are either ex-Academy men or World War emergency officers. Each division may have six line officers, two lieutenant commanders, and four junior officers, besides a doctor and a paymaster. If an officer, for business reasons, goes to another locality, he is detached from the division, ceases to be a fleet reserve officer, and is transferred to the volunteer reserve. The development of a division is ninety-nine per cent leadership on the part of the division commander. His knowledge of the Navy is almost secondary to his leadership qualities and to his position within the community. If he is of the rank of lieutenant commander, he does not go with his division upon mobilization to the ship assigned, but remains to build up another division or do any other duty that the commandant of the district may assign him. This is because the mobilization plans assign an executive from an active boat to command.

At present, many of our fleet reserve officers are ex-regular officers, the balance being reserve officers having had war service. This reservoir of officers cannot be relied upon in the future to fill our requirements; because of this, the reserve officer's training corps units were organized at six universities. These younger men, specially selected, do not become reserve officers until they graduate, at which time we expect a small proportion to settle in communities having fleet divisions, and become attached thereto. As funds are increasingly appropriated, a larger number of R. O. T. C. units will be organized.

The entire basis of development of these fleet divisions is organization development, and not the individual development that has been the case in the past. In order to promote these divisions as efficient ship organizations, we have placed them on a competitive basis. This is done not in a perfunctory way, but on a very carefully worked out plan. The naval reserve inspection board, consisting of a captain, two commanders, and one lieutenant aviator of the regular service, inspects each organization once a year. This is a big job in itself, and a very arduous one, but in order to prevent unfair competition, it was deemed necessary that the same board, or a majority of it, should inspect each organization.

This competition is made up of several factors, the most important of which is what we term "mobilization efficiency." This has the highest weight in the final multiple, and is defined as the efficiency measured by the ability of the organization to man its ship or station in such a manner that the ship or station may immediately carry out its war-time mission.

This efficiency is made up of two sub-

factors: procurement, and knowledge of the organization to man its ship. The former is the percentage that a division carries of its required rating; while the latter is determined by the inspection board.

Another important factor having considerable weight in the final multiple is the percentage of the division that performs its fifteen-day cruise. In days gone by, training cruises were given to individuals, but those days are over. The division is now required to go to sea as a division, and all requests to be excused must be referred to the bureau. Great pains are taken to have this cruise successful from a division standpoint. The itinerary and dates are made out at least six months in advance in order that the officers and men may arrange that their civilian work and reserve cruise will not conflict.

Another factor is the average drill attendance of the division for the year. There are still other factors of less weight which the inspection board determines during the inspection. At the end of the year the final multiple is computed and trophies awarded to the winning division and to the winning battalion. The battalion consists of two or more divisions, and is organized only in large cities.

To give some idea of what these divisions do for developing destroyer knowledge, it may be interesting to say that in a great many cases destroyer divisions have drawn to scale on their armory floor the deck plan of their assigned destroyer. This plan gives guns, torpedo tubes, hose connections, frame numbers, etc., and when the inspection board calls for an emergency drill, they carry it out very realistically.

Each division has a Watch, Quarter and Station Bill identical with the one they will use upon mobilization. In other words, once a week they carry out drills and hold classroom instruction so that if mobilization should come tomorrow, each man of the division could go aboard his ship and know where he eats, sleeps and drills.

Each summer all fleet divisions are given a fifteen-day cruise. This year the West Coast divisions were given a splendid cruise to Honolulu and to Alaska. On the East Coast it is more difficult to arrange interesting cruises because there are many more destroyer divisions, requiring several cruises for each destroyer of the scouting fleet. The fine coöperation from the destroyer squadrons commanders of the Pacific and of the Atlantic have made these excellent cruises possible. They require a considerable sacrifice on the part of the destroyer personnel, as a certain proportion of the officers and men must be sent on leave in order to make room for the reserves.

An improvised target practice is a new step. Last year they fired only one gun's crew, but this year they are firing two. The practice does not correspond to any of our regular ones, but simulates an antisubmarine attack. Firing at a spar corresponding to a periscope, the hits are constructive, but nevertheless, the divisions are given a standing, and trophies are awarded. It has done great things toward developing these divisions, besides making their cruises of greatly increased interest.

From the above it will seem that the bureau's entire effort is, and has been, to develop trained organizations. Considerable progress has been made, as each year more enthusiastic reports are received from the commanding officers of destroyers relative to the fleet divisions.

The other branch of the fleet reserve is the aviation reserve. They, too, are built up for organization development. This has not been the entire case in the past, but is a new policy which has been put into effect during the last six months.

Reserve aviation organizations were authorized at localities where universities carry ground schools in their curriculum. There are thirty-one aviation divisions, located at Squantum, Far Rockaway, Philadelphia, Washington, Hampton Roads, Great Lakes, Detroit, Minneapolis, St. Louis, Sand Point, San Francisco, and Los Angeles. Among these thirty-one there are ten squadrons consisting of two or more divisions each. The total aviation reserve consists of 190 fleet officers, 150 volunteer officers, and 570 men. The remaining divisions are detached divisions at localities where it is expected to build up a squadron in the future.

The reserve officer in command of the squadron or division supervises and instructs at the ground school. The students, selected from the senior classes, enter the ground school at the end of one year. A small proportion are picked to carry on after passing the necessary physical examination.

They then become seamen second class in the volunteer naval reserve and are called student naval aviator pilots. After completing forty-five days of primary training at reserve aviation bases, they take sixty days of advanced training at Pensacola. Upon successfully completing the advanced training they are commissioned ensigns in the reserve and made naval aviators, provided they conform to all the flying requirements.

For the last two years fifty ensigns (naval aviators) have been sent to the fleet for a year's training. From the fleet it is expected and hoped that they will go back to the localities from which they started and be the reservoir of reserve flyers from which the reserve squadrons draw their future personnel.

The desired goal is to have each reserve aviation organization fully equipped with hangar and planes. At present there are splendidly equipped organizations at Squantum, Rockaway, Great Lakes, and Sand Point on Puget Sound. This year it is expected to complete the equipment of the division at Detroit, the squadron at San Francisco, and to partially equip the squadron at Los Angeles. The aviation squadrons and divisions are under the same competition as are the seagoing fleet divisions. They are inspected annually and compete for Department trophies.

The next branch of the reserve is the volunteer reserve. The difference between the volunteer reserve and the fleet reserve is the difference between a completely trained football team and a trained unattached player. In other words, the volunteer is an individual trained either for general service, or for any specialized service. He belongs to no organization and is not required to train or to attend any drills. The volunteer reserve comprises a large proportion of the total naval reserve and consists of 10,000 men and 2600 officers.

Upon mobilization they will fill billets on shore or afloat, where their special knowledge would fit them. The volunteer specialist is a man who has attained a distinction in his vocation which fits him particularly for that specialized duty within the Navy. For example: medical officers for special service are necessary in order to organize complete hospital units. There are specialists in electrical engineering, naval construction, ordnance, naval intelligence, and law, all individually assigned for mobilization.

One important branch that has this year been put on a sound basis and which some day will probably fill more of a fleet reserve position than a volunteer one, is the new volunteer communication reserve. Naval Operations has stated that it will need 6,000 additional officers and men for the communication service at the outbreak of war. This is a big order, but advantage has been taken of the enormous number of radio enthusiasts who have lately appeared throughout the country.

Each naval district has been divided into volunteer communication reserve sections and subdivided into units. Each has a central control station from which messages are sent out on drill nights to the various volunteer reserve organizations. The work is supervised by the district communication officer under the commandant. In certain districts considerable progress has been made, and although only about four months old, there are now 300 officers and 500 men. It is hoped that funds set aside for training in the fleet for the fleet reserve may not be entirely expended in order that a number of the communication reserves may each year be sent to sea or on active duty at a radio station for naval indoctrination.

There is one weak point about the volunteer reserve which the bureau is endeavoring to clear up, and that is the lack of sufficient contact with the regular service. Effort is made to keep contact with the volunteer reservists by bulletins not only from the bureau of navigation on reserve matters, but by bulletins from the particular bureau that the reservists may be associated with. This is not enough, and the volunteer reserve drifts apart from the regular service and its ultimate war-time mission. The bureau tries each year to save enough funds to send a few of the volunteers to sea, but this only takes care of a very small number.

Correspondence courses are receiving great support from the field and although they entail a tremendous amount of work, the expense and extra charge are well repaid by this contact.

Finally we come down to the merchant marine naval reserve. This is in its infancy, as it is hardly six months old. The

writer believes that nothing has been accomplished by the bureau of navigation in late years which has such great possibilities as an asset to the national defense and he further believes that nothing has ever been done by the Navy that has in itself combined greater aid to the Navy with an enormous material aid to a national industry that is having great difficulty in keeping afloat.

The Naval Reserve Act of 1925 created the merchant marine naval reserve and stated that officers and men therein would receive one month's pay of their rank and rating a year. Congress, however, tied a string to this section of the act by stating that no funds would be expended for the merchant marine naval reserve unless they had been specifically appropriated. Efforts in 1925, 1926, and 1927, all failed to get money for this branch. It resembled so strongly a subsidy that Congress was afraid of it. The Department did its utmost to show that it was purely a move on the Navy's part for national defense, but the objections to the appropriation of funds were never lessened.

This year, convinced that the Navy had waited long enough, and that a merchant marine naval reserve had to be established to safeguard the regular Navy personnel and the fleet in case of another national emergency, the bureau decided that an effort should be made to establish it on a purely voluntary basis. Letters were sent to all ship operators throughout the United States, explaining what the bureau hoped to do, and the aid that would accrue to the merchant marine.

It is the bureau's contention that when properly organized, and when the officers and men are receiving training courses, particularly in engine-room and fireroom practice, operating costs will be considerably reduced. Further, it is felt that the prestige of the Navy will be carried over, at least in part, to the merchant marine, when vessels fly the merchant marine naval reserve flag to indicate that they conform to all the requirements of the Navy, and can advertise that they have been designated by the Secretary of the Navy as reserve vessels. As a result it is certain that this prestige will bring added freight and certainly increased passenger traffic.

The response from the operators was beyond the most extravagant expectations, and many even offered their offices and personnel to help organize the reserve.

With the operators so firmly behind the effort, the organization was begun only on the ships basing in New York and San Francisco. Its popularity was so great, however, although it was on a purely voluntary basis, that the doors had to be thrown open in each naval district.

Original plans called for "unit organization," in other words, officers, men, and ships constitute a unit and upon mobilization the unit is taken over. This plan had to be abandoned for the present as the non-permanency of officers and men made it impracticable.

The first step was the designation by the Secretary of the Navy of all vessels of United States registry, considered suitable for Navy use in time of war. This being done, the interviewing of officers was begun. An officer in each naval district visits the designated ships as they come into port and talks individually to the officers. A detailed questionnaire is filled out, with the final recommendation from the inspecting officer in each case. As yet the men have not been included, chiefly because it was deemed best to launch the reserve on a smaller scale and wipe out the bad features, before going in for the fo'castle and fireroom hands. As crews ship only for a voyage, their administration until some permanency develops seemed a problem that required careful handling, and certainly warranted caution in its initiation.

Unfortunately the magnitude of the work was not realized. Ships arrived in port one day, and in the case of tankers, were gone the next; officers would go on leave and shore crews take charge. So the initial organizations fell behind.

The fear of doing an injustice to an officer physically fit and otherwise qualified for the merchant marine naval reserve, but who, because his ship was on the other side of the world, could not be commissioned at the same time as those fortunate enough to be in a port at the United States, decided the bureau to round up all applications and physical examinations, and to hold them until July 1, when a board would work out their seniority from information gathered from the interviews, the operators, the Shipping Board, and the Department of Commerce.

As a step towards increasing the caliber of the personnel in the merchant marine, the bureau of navigation has issued instructions permitting men paid off from the Navy to ship in the merchant marine naval reserve, and after two years, to ship over in the Navy under the same conditions as are allowed continuous service men.

Any real progress in naval training by the merchant marine naval reserve depends almost entirely upon the appropriation of funds.

In considering the reserve as an important adjunct to the national defense, it is pertinent to note that the armaments conference of 1921 failed to place any limitation whatever upon personnel; consequently this country is today in a position of marked numerical inferiority in the matter of reserve personnel, which should be overcome. The ratios established for ships mean little or nothing while great disparities in trained personnel continue to exist. Further, the disparity in ships which do not now fall immediately into the naval category, but which may readily do so in the event of conflict, should be a matter of concern. That considerations such as these have been noted abroad is clearly evident and the problem of reserves (both material and personnel) has been given for years the study and consideration deserved. To its importance we too are now awakening. It is a potent fact that either by conscription or by voluntary means, forces of trained reserve personnel are now in being, abroad, challenging the forces of the regular establishments in numerical strength. The statesmen and strategists abroad are keenly conscious of the many benefits inuring to their respective countries through the maintenance of such forces at the very slight expense involved.

We are all keenly alive as to what the mastery of the sea means in a nation's life. Let us overlook no present or future opportunity to see that we do not lag behind. This naval reserve of ours is in its infancy—it needs discipline, perhaps, but it certainly also needs parental kindness and coöperation in order that it may develop in strength, character and that fitness which reflects credit upon its heritage of the sea. The Navy can help and should help—it is not a mere casting of Navy bread upon the waters to return to us after many days. The Navy is strong, willing, and capable of supporting a large family. That we may live the longer as a nation, let us develop and conserve our family strength. Our present maritime strength is none too great and it is an old business adage that "one cannot make one's living out of one's enemies." Friendship means good business for all hands.

Communications

By Rear Admiral T. T. Craven, *U. S. Navy*
Recently Director of Naval Communications

Communications and Peace Strategy

Some seventy years ago Emerson concluded that "after all, the greatest meliorator of the world is selfish, huckstering trade." Today the accuracy of his observation is evident, for business everywhere is accepted unquestionably as the world's greatest benefactor; and despite the care required to guard the interests of the public against unscrupulousness and cupidity, commerce has proved itself the best vehicle for international understanding.

Just as long as man exists there will be competition in trade, but it must seem evident that only a dire threat of national disaster incident to distorted economic conditions or some other equally vital national issue can become the real cause of a far-reaching break in international relations between major states, for statistics give the stupendous figure of $17,000,000,000 as the present and constantly rising value of the yearly imports of the leading countries of the world.

Speed and directness of communications are the essentials upon which this big business everywhere depends. Morse, Bell, and Marconi were the giants whose strides annihilated space for the man of affairs. Due to the achievements of science, over wire or through space are conveyed the mass of correspondence incident to commerce, while, by the same means, that great shaper of public opinion—the press—constantly spreads the information which originates and sustains both intercourse and trade.

The definite advantages conferred by the use of the telegraph, now so self-evident to everyone, were not at first apparent to our citizens, and when America finally awoke to the importance of international contacts, foreign control in world-wide communication was discovered deeply intrenched behind almost impenetrable barriers. Going back to the time when wires first became practicable as communication arteries, we hear President Grant pronounce that the landing of a cable on the shores of America "gives no monopolistic rights to a cable company, and that cable rates shall be just and reasonable." The President stressed the only two factors which the United States, then primarily concerned with domestic development, considered should be guarded in employing the channels just made available for distant correspondence.

Long before this era, at a time when the diplomat and the sailor were together opening wide markets for British merchants, the empire of Great Britain, through the processes of diplomacy and of war, established commercial bases on trade routes. The merchant soon recognized communications as the handmaid of commerce, and the British, just as soon as the practicability of the wire was shown, proceeded to create the wonderful system of cables, totalling more than 190,000 nautical miles, which now enmeshes the globe. This great net soon caught, and has since tightly held, the floating traffic of the seven seas. With wise forethought and appreciation of the value of advertising and the spreading of propaganda, Great Britain has always maintained an exceedingly low rate for press over her cable system. This policy has been extended to include radio and, as a result, international news everywhere goes forth with a British accent.

The Briton, with widely scattered interests, today understands thoroughly that for him the very problem of empire, in peace as well as in war, has become the problem of communications. Indeed, throughout all Europe, the means for a world-wide exchange of information is accepted as being as vital for defense as it is for prosperity. The home-loving United States, boasting of the possession of the most extensive and perfect system of interior communications of any country in the world, has but recently

appreciated the fact that, when she became unavoidably entangled in international affairs, far-flung communications took on an importance equal to that of the domestic telegraph and telephone.

Interest in these matters has now become vital to us, for the exportation of American products has become a controlling factor in the well-being of America. The support of our foreign trade and the upbuilding of American shipping demand the control and the security of our own communication systems. A slight study of the subject will serve to emphasize the ease with which the owners of a carrier system can govern the source and character of information and thus largely control both commerce and public opinion. Furthermore, if we desire that future generations find the present valuable American insular possessions permanently attached to the United States, a definite detail of our present-day peace strategy must lie in keeping our dependencies informed of American affairs and, at the same time, of sustaining the interest of our people at home in intercourse and in business relations with their fellow citizens who live abroad.

Unhappily, the United States seems disinclined to give any more attention to this paramount detail in America's "preparedness" than it concedes to many other problems with the solution of which the future must concern itself. As an indication of present-day conditions, one need only consult our daily newspapers and note the insignificant space taken up by items from the Philippines and from Porto Rico. Local papers in those distant localities contain but a small amount of information from the home land, as responsibility for the supplying of news from America to her outlying possessions unfortunately does not exist.

Passing from the consideration of details of peace strategy to a brief survey of the communication art, we see that it, like that of aviation, is moving ahead at a rate which makes the sailor's task of keeping abreast the times both difficult and costly. Recently wireless, with many economic odds in its favor, has become a strong competitor of the cable, but just as radio appeared to be taking on definite shape the development of high frequency upset all plans and necessitated an entire revision of the communication problem. Above a frequency of 3,000 kilocycles (100 meters), considered to be the limit for communication purposes in 1923, about 1,570 new channels have recently been made available. The 1,400 channels between 4,000 and 23,000 kilocycles carry over long distances and are, therefore, international in character. It was with the allocation of these to particular services, to minimize interferences, that the International Radio Conference, recently held in Washington, was particularly concerned. Considerable work was accomplished by that important body but much more will be ready and awaiting the convention of 1932. At present the major radio effort everywhere is directed toward bringing within reason the demands of the many interests, each feeling the need for a communication service which appears cheap and easily procurable. Many applicants for license do not realize that of the total channels in existence but a fraction can be assigned to any one country, and that the problems incident to interference already are tremendous. Unless these are solved the usefulness of radio will be seriously impaired.

In so far as the Navy is concerned there are compelling reasons for the use of both high and low frequencies. New devices extending the usefulness of radio appear almost daily, but time and money are required for accomplishing extensive changes. Practically all naval establishments are involved in every alteration undertaken and changes, therefore, can not be accomplished suddenly, despite the fullest appreciation of their importance.

War Strategy

During the World War the communication phase of naval strategy as practiced in the North Sea was of constant interest. In other theatres the early operations of the German cruisers offered only brief opportunity for a study of the strategic use of distant communications. The exercise of censorship and close supervision over cables, war-time measures of the past, were undertaken upon an unprecedented scale immediately upon the resort to arms, but the results of the meager wireless experience of the Russo-Japanese war did not supply the operators of 1914 with proved theories or standardized procedure regarding the employment of radio.

The Germans, unlike the English, failed,

until after the Battle of Jutland, to realize completely the strategic value of their new devices and by their indiscreet use of wireless almost nullified any advantage of an initiative, which, if better fostered, would have been their greatest asset in the North Sea area.

Immediately upon the outbreak of hostilities the Allies, under the guidance of the British, took steps to control enemy distant communications, for it was realized that the long but slender chain of naval power retained by their adversaries was suspended rather from the points where information was procurable than from the few shore bases open to their ships.

A committee considering the nature of the offensive to be commenced against German overseas possessions decided as a governing principle: "All operations are to be regarded primarily as designed for the defense of our marine communications and not for territorial conquest." (Corbett, p. 129.)

German cable connections were promptly cut, the lines joining the Continent, the Azores, and the United States, being severed in the British channel within a few hours after the declaration of war.

The German radio net had been well established, but without command of the sea centers could not be maintained. Within three months Tsingtau, the German stronghold in Asia, together with the radio stations at Yap, Samoa and Angaur had all passed nto British hands. Within this same period, Kamina, on the west coast of Africa, and Dar El Salaam, on the African east coast, were both lost. The capture of these major points together with others of lesser importance, deprived the Central Powers of an ability to communicate with their naval units scattered in distant seas, and increased the likelihood of discovery of German vessels by compelling the employment of ships' radio. While America remained neutral, the Teuton was able to avail himself of the United States as a relay post for much of his international correspondence. This continued until his failure to guard his confidential, but decidedly objectionable, dispatches to Mexico finally became one of the direct causes of the entry of the United States into the European arena.

For a time the German Admiral von Spee lurked under the shadow of his communication towers in the islands of the Western Pacific, and through them and those at Tsingtau arranged the plans for his voyage. Radio then played its part strategically in his movement across the Pacific, in his encounter with Cradock, and in the search which finally ended at the Falklands when fate overtook that gallant seaman.

Radio finally resulted in the destruction of the *Emden*, but it is interesting to note that when the *Hampshire* was told off to search for the *Emden* after the famous raid off the Hoogly, the ship was seriously embarrassed by the large number of messages in clear text sent by the Indian authorities. The *Hampshire* finally asked by cable that no messages be sent by radio, but the captain of the *Emden* had already ascertained that British ships were searching for him. (Corbett. *Official History*, Vol. I.)

German cruisers cut the British cables at Fanning and Cocos Islands. These damages were soon repaired, but the indication is clear that in the protection of cable and radio channels will be found a serious problem for naval command in the event of war. Localities where these become accessible are definitely marked as points for attack.

Because of the lack of secrecy on the part of the radio carrier, the science of cryptography took on great importance during the World War. Each side appears to have had success in utilizing the other's codes. Misleading the foe through the employment of a radio cipher known to be in his possession may become a possibility in the next holocaust, and broadcasting, the most potent of agents for spreading information, may so readily assume a military guise, that the employment of the broadcaster will demand very serious attention.

In passing, one may pause for a moment to consider the conditions in which Togo found himself when, his patience at test, he awaited the enemy at Tsushima. He had made his estimate of the situation and reached his decision. Nothing disturbed him or changed his purpose. Were he expecting his enemy there tomorrow, he would probably be the recipient of an avalanche of information of great variety and from many sources, much of it incorrect. Would he be able to preserve his imperturbability under such circumstances? And what steps would he take to distinguish the true from the false?

In the make-up of the successful leader of

the future, wariness and cool judgment more than ever before must be combined with personal knowledge of the adversary's habits of thought and of action.

Tactical Employment

Though the mantle of glory enshrouding the records of Jutland is almost threadbare because of the handling it has received from seekers of information during the past twelve years, we must, nevertheless, turn again to accounts of this battle for our lesson on the tactical employment of fleet communications.

As one studies the reports of what happened and ponders on what might have occurred, the fact confronts him that leadership in its preparations failed to measure correctly the paramount importance of sure and speedy communications. The communication plan adopted by the British leaders did not supply the key to make possible the effective concentration of their vast armada, enveloped as it was in haze, and scattered over many leagues.

The records indicate that, scattered throughout the British organization, there was always the information necessary to permit the heartily wished-for concentration, but the data were never collated in a fashion to permit its employment.

An exaggerated importance appears to have been attached by certain commanding officers to keeping the position of our battle fleet concealed during the night at all costs. During the early hours of darkness Scheer must have known, approximately, the whereabouts of our fleet. He must have known it was somewhere between him and his base. Wireless silence was not, therefore, as important as before the fleets met, and it would have been to our advantage to break wireless silence rather than to leave Jellicoe ignorant of the movements, or whereabouts, of portions of his own fleet and of the enemy. In several cases important information could have been passed to the *Iron Duke,* visually, by shaded flashing lamp, but even this comparatively safe method appears to have been sacrificed at the expense of secrecy.

This unnecessary caution is apparent when we find from the official despatches that between 9:17 P. M., when the *Iron Duke* made the last signal before nightfall, until 2:20 A. M., when it was again light enough to distinguish flag signals, no less than forty-two wireless and eighty-five fighting lamp signals are recorded, many of which are of comparatively trivial nature. (*The Truth about Jutland,* p. 135.)

For intership and intersquadron communication the Germans generally used a low-power, short-wave apparatus, and employed high power for jamming the English radio. As a consequence, the Germans appear to have been able to get their messages through, while the English had constant trouble with their communications.

Like the Japanese on the eve of Tsushima, the Germans before Jutland were careless in their use of radio and the British deduced from the volume of intercepted traffic and through deciphered messages that the Germans were planning a demonstration or sortie with the whole High Seas Fleet. But, once the battle was joined, the excellence of the German staff work was apparent and they made the better use by far of their communication appliances. The two drastic "turns away" during the heat of battle and at a time when signalling facilities of many of Scheer's ships were damaged, is a striking example of German efficiency in tactical communications. As an evidence of certain details of communication preparedness, we note a German shore station, intercepting Jellicoe's message prescribing the night positions for the destroyers of the Grand Fleet, passing it promptly to Scheer. Finally, we have the picture of what the British should have done, actually being done by the enemy; through intercepted messages, Scheer knew that if he kept the British destroyers on his starboard bow or ahead, the Grand Fleet would be on his starboard hand steaming away from him. By observing the direction of the firing and the searchlights of the light forces engaged, and by frequent reports from his light forces, Scheer was able by occasional change of course to keep the Grand Fleet on his starboard hand and so escaped across their rear toward Horn Reef.

During the war the sailor's enemies become as evident as his mistakes, but during the peaceful exercises of navies, when it is almost impossible to measure proficiency correctly, heresy constantly lurks in the offing. Unless the subtle presence of this foe is realized, he insiduously but surely secures a commanding position. The British performance at the Battle of Jutland supplies an excellent example of the effects of heresy.

In the daily peace-time exercises of all fleets, the regulation of every detail tends to become centralized in the fleet flagship, through a presumably infallible system of communications. Such a plan produces a

better and more interesting drill and stresses routine, but its unsoundness in battle appears to have been made clear; for with units out of sight and spread over a wide area, and during the stress and interference of conflict, no single hand could minutely direct them all.

Efficiency demands that methods keep pace with technical development. Radio channels are now far narrower than was the case ten years ago. Consequently there is less interference in ordinary traffic and many more channels are available than previously. Increase in the number of channels, while permitting greater flexibility, more reliability and more service, requires a vast increase in supervision and in intelligent control of details.

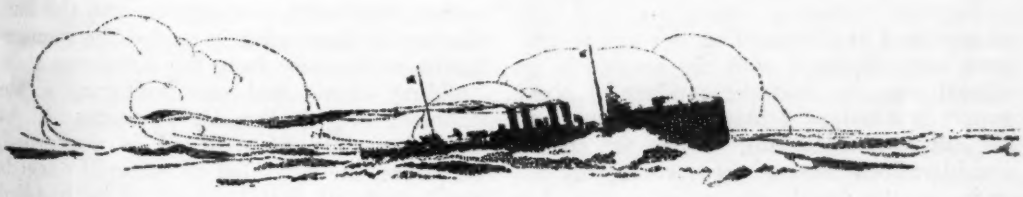
One great improvement in naval power came through increase in the precision of fire control; now comes a new and important agent for vastly strengthening a mobile fleet through a technical advance in radio. The most important, definite, and practical problem confronting the present day naval man is how to use his newest implement skillfully.

As success in communications, permitting the coördination of operations beyond the view of the commander-in-chief, depends primarily upon the knowledge of how, when, and where to send intelligible messages, and can be gained only through a common understanding on the part of those directly concerned, it seems clear that the time has arrived to construct a chapter for the benefit of naval leaders which will set forth principles, if such can be discovered, to assist the passing of information and of command through subordinates.

Those attempting this work will again be impressed with the fact that naval warfare is an old trade, the fundamentals of which are unchanging. They will find that the problem of the moment is but an expansion of the problem of the eighteenth century, when the importance for naval commanders of being able, not only to conceive the correct ideas, but to transfer them beyond the range of their powerful voices, first appeared as a necessity.

Investigators will note that in 1782, Kempenfelt introduced the *Primer of Speech for Fighting Ships*, or *Signal Book*, to permit commanders to communicate their thoughts. The adoption by the Navy of Britain of a system of signals which permitted coördinated operations to the limits of visibility has been called as revolutionary a step as was the adoption of heavy guns by the British vessels, first used by them with crushing effect against the Spanish Armada nearly two hundred years before.

It has been stated that "War is an affair of getting news, interpreting it, and acting upon it." The leader who undertakes to do all of the thinking for his juniors, a process which easy and reliable peace-time communication encourages, and deadening routine tends to promote, and of relegating to subordinates rôles that are merely mechanical, will fail in the future as he has in the past. The Nelson of tomorrow, in order to obtain an efficiency that will bring order out of chaos, will require exercise in communications carried much further than the mere transmission of messages over the various systems evolved for this purpose. He will understand that one more important item has been added to the already heavy load of responsibility shouldered by the captains of his fighting units, and that another detail of team work demands organized attention.



Supplies *for the* Navy

By Rear Admiral Charles Morris *(SC), U. S. Navy*
Chief of the Bureau of Supplies and Accounts

WHEN attention is focused on the Navy, the spectacular features of that organization stand out in such bold relief that many of the other essential elements of the service are passed by unnoticed. It is easy to visualize a fleet or individual parts of a fleet, such as a battleship, cruiser, submarine, or seaplane, for these elements of the service receive much attention in the press and news reels. But it is difficult to catch the popular imagination or public attention with details of the complex organization making up the Navy—the organization that concerns itself with providing for and maintaining the fleet in a high state of efficiency.

Of the utmost importance among the functions of this organization is that of supply. No fighting unit can be at the peak of efficiency when needed materials and equipment are not available at the time required. Conduct of the supply phase of the functions of the Navy was years ago considered so important that it was made the business of a distinct branch of the naval organization—the bureau of supplies and accounts. Along with the conduct of supply, this bureau also handles closely allied phases of Navy business, such as accounting and finance, and in the conduct of this work it takes equal rank with the organization handling personnel matters, the bureau of navigation; the one administering aeronautical work, the bureau of aeronautics; and the five other bureaus of the Department.

There is a general feeling common both to members of the naval service and to persons not connected with the service in an official capacity, that the conduct of Navy supply is a unique problem, mysterious and difficult to comprehend. There are special considerations arising from conditions peculiar to the naval service, of course, but in general, naval supply is not a thing of mystery. In its work the bureau of supplies and accounts constantly endeavors to keep pace with commercial practices. The fundamentals of sound business conduct apply here as well as in the business world.

In so far as the supply phase of its activity is concerned, the Navy may be considered as a large department store with one important exception—it does not operate for profit. It is like a department store in that it procures at as low a cost as possible, maintains a stock of, and delivers to its customers, a variety of items of the quality desired. The customers are the units of the fleet and the shore activities of the Navy. It is likened to a *huge* department store, since the stock of material on hand in the principal account under which general naval stores are carried was approximately $97,000,000 on July 1, 1927, the purchases of material for the Navy in this account during the period July 1, 1926, to July 1, 1927, approximated in value $58,000,000 and the issues (the department stores sales but at cost price) amounted to about $83,000,000.

The complete list of material required by the Navy includes some 40,000 items. These are the same items that would be required by a city with a population of about 100,000. Practically every human demand which would arise from such a city must be supplied to this Navy personnel of corresponding size. In addition to the human demand, there are technical professional requirements—ships, aircraft, guns, ammunition, machinery, instruments and the like. On top of these must be added the requirements which arise from the numerous shipbuilding, repair and manufacturing establishments which the Navy maintains. As far as variety of material is concerned, therefore, the Navy list of material exceeds the bounds of that believed to be handled by the largest of department stores or even the larger general mail order houses.

Classification, and with it a system of designating symbols, has for a number of years been recognized by leaders in the industrial world as a prime essential of scientific management. The material sciences are all built up on a foundation of classification. Biology has kingdoms, branches, classes, orders, genera, species. Each individual has a location all its own in this classification and this is the only way through the complexities of living matter. Similarly classification and symbolization are essential in the complexities of modern business. Outstanding among the early exponents of the application of these principles in industrial establishments are Frederick W. Taylor and C. Bertrand Thomson, but curiously, it is not until recent years that the ideas they so ably advocated have come into general use. The beginning of the use of these principles applied to naval stores was made as early as 1892 at the New York navy yard. The application gradually developed until in 1914 the *Standard Stock Catalog of Naval Stores,* listing each item of naval material and assigning to it a designating symbol, was prepared. The use of the standard nomenclature was made mandatory upon all naval activities, ashore and afloat, by order of the Secretary of the Navy, on March 25, 1915. Since that date the original has been constantly revised and improved upon until now the Navy has a standard alphabetical-numerical stock-numbering series admirably suited to its purpose and believed to be the only one in existence.

Basically, the Navy classification of stores separates the 40,000 items of material into eighty-one classes, all items within a class being physically related. The department store practice of having such departments as furniture department, china department, shoe department, etc., where the prospective purchaser goes for the items indicated by the descriptive name, follows the same principle of classification. Each class in the Navy has been assigned a number arbitrarily and each item within the class is assigned a symbol, which symbol in conjunction with the class number designates a particular item in all matters of record, such as requisitions and stock records dealing with that item. A few examples of these classes and symbols are as follows:

Class 17—Electrical apparatus and all accessories, outfits and parts. Stock No. 17-L-493 designates lamps, electric, incandescent, tungsten filament, gas-filled, standard, 115 volts, 100 watts, MS Base, inside frosted.

Class 41—Tools, hand.
Stock No. 41-H-17 designates hammers, machinists', ball-peen, weight 24 ounces.
Stock No. 41-L-20 designates levels, machinists', nickel-plated, ground-glass, length 12 inches.

In the second example the number 41 denotes the number of the class in which the item falls, the letter H is the alphabetical designation, and the number 17 denotes the seventeenth item under the letter H in class 41. In this manner the Navy has evolved a system of classification and symbolization of stores and material to aid in procurement, storage and issue of material.

The activities of the Navy are far flung and it may well be said with literal accuracy that they cover the world. Naval establishments on shore are distributed throughout continental United States and are found in many of the outlying possessions. Units of the fleet are constantly cruising over a major portion of the waters of the world; in many cases they are away from sources of supply for long periods and it often happens that they return to bases of supply for very short periods of time. Prompt service in supplying the material needs of these activities, application of the principle of purchase in large quantities to obtain low prices, and insurance of an adequate stock of material to supply naval needs in the early expansion days of war time requires the Navy to maintain a stock of stores large in quantity as well as in number of items. In doing this, a problem of financing the purchasing and storage of material during the interval between procurement and final use is introduced. As in civil industrial establishments, department stores and others, a portion of the capital of the company is at all times tied up in raw materials, work in process, or finished goods awaiting sale, so the Navy has funds tied up in material in the course of manufacture and in store awaiting the time of need and issue. From the figures quoted earlier it is seen that the rate of turnover in the Navy's principal stores account is somewhat less than once a year.

Navy supply thus has a financial aspect. As a matter of course, the cost of materials used must finally be borne by one of the annual appropriations by the Congress for

the support of the naval establishment. The cost of the material could be borne by the appropriation bearing the final charge at the time of purchase, but for items of common use this method has been deemed inadvisable. Materials are not necessarily used during the fiscal year in which purchased and to charge an annual appropriation at the time of purchase would result in erroneous charges, particularly for items used in ordinary maintenance. Again, many items purchased are of common use under several of the appropriations in the appropriation system now followed and it is impossible to determine at the time of purchase the ultimate use to be made of the article. To purchase separate quantities of the same item, definitely earmarked for each of the bureaus requiring it, is not economical, since the total of the reserve quantities necessary to insure adequate supply for each bureau would far exceed the reserve quantity necessary to insure all being able to obtain their needs from one stock.

The Naval Supply Account Fund, originally created by the Act of March 3, 1893, as the Naval Supply Fund, solves this financial problem. It was designed to finance the procurement of ordinary supplies required for the use of the several bureaus in such quantities as to permit economical purchase and to provide a stock available for prompt issue to any bureau requiring it. Upon issue, the appropriation of the bureau concerned reimburses the fund. From a small beginning, amounting to $200,000 in 1893, the fund has grown by subsequent legislation into the present naval supply account fund, authorized by the Act of March 1, 1921, amounting in supplies in store and credit with the Treasury to approximately $118,000,000, on July 1, 1927.

Through the medium of the naval supply account fund the Navy is able to procure supplies and materials for general issue as a charge to any appropriation without regard for the limitation of fiscal years or annual appropriations. It permits the purchase of articles in large lots at suitable times and the holding of them for issue to any call. Supplies purchased under the fund are held in store and accounted for in the naval supply account.

The naval supply account fund and its property accounting corollary thus cares for the common items of supplies for the Navy and the bulk of the Navy's material is cared for under this heading. There are, however, three other accounts under which materials for the Navy are purchased and stored.

One of these is the Clothing and Small Stores Account. Clothing and clothing equipment are purchased through the clothing and small stores fund. This is a revolving fund, similar to the naval supply account fund, created by Congress, to which purchases of clothing are charged and to which issues of clothing, charged against the individual account of the person drawing them, are credited at the issue price. The property accounting corollary here is the clothing and small stores account.

Another is the Appropriation Purchases Account. Certain material, particularly ordnance and aëronautical material, required by bureaus for particular purposes, are purchased from the appropriations concerned. These materials are held in store in what is known as the appropriation purchases account, and upon issue no further appropriation charge is necessary, since they have been already paid for out of a specific appropriation. Any one of a number of reasons may support a decision to purchase material under this account, rather than under the naval supply account fund. Obviously, no useful purpose will be served by purchasing an expensive item of equipment for a particular project from the general naval supply account fund. The balance in the fund represents re-credits on account of charges to appropriations at time of issue of stores from the fund and, as this general fund is for the procurement of material for common use and is a revolving fund, it is essential that this balance be available for purchase and maintenance of material for common use. To tie up large sums of any available balance in the purchase and holding of special expensive items would be a detriment to the service without a corresponding gain.

The third account is known as the Reserve Material Navy Account. There are certain items that, because of limited production or the length of time required for procurement, it is desirable to maintain in store as a reserve for the purpose of fitting out vessels of the fleet and merchant auxiliaries in time of war or national emergency. Such items are purchased as required under the appropriation "Reserve Material, Navy,"

are carried in store in the "Reserve Material, Navy" account and may only be issued from this account without charge to any other appropriation after notification that a state of war or national emergency exists. To prevent deterioration and to meet peace-time emergencies, transfers of this material to the naval supply account may be made, the reserve material appropriation being credited, and upon issue the proper appropriation being charged.

A correct decision as to the amount of any item of material to carry in store is most important in Navy supply. Too large a quantity of any item is inadvisable since its presence in the storerooms ties up a part of the balance of the naval supply account fund and needed materials cannot be purchased as required. Large stocks of any item are apt to deteriorate or become obsolescent before needed for use. On the other hand, a stock too small makes it difficult or impossible to supply the needs of the service. Futhermore, quantity purchases can usually be made at lower prices than small and frequent purchases. The happy middle ground of efficient supply lies between these two extremes.

The department store buyer in determining the quantity to be purchased is guided by past sales, probable future style trends, keeping qualities, ease of procurement and the prospective buying power of the public he serves. An incorrect decision is just as disastrous as in the Navy; excess amounts must usually be disposed of at reduced prices, causing a loss to the store; and a quantity smaller than that readily salable means lost profits and patronage. The Navy, like the department store, in determining the quantity of an item to purchase, is guided by the same principles. Style trends are not so important, although changes in practice as to the use of certain materials has a similar effect. Some years ago practically all vessels of the Navy used coal as a fuel; now by far the greater number use fuel oil. The probable appropriations to be made for the service is for the naval buyer the same as the prospective buying power of the public to the department store. However, the size of future appropriations has been given little consideration, probably because the Navy has not recently suffered any great reduction in active units. In the main the Navy's stock upkeep system is based on past issues.

A decision as to the quantity of material to be carried is not simply a mere determination of the total quantity of each item that should be in store. The activities of the Navy are widely scattered and proper supply requires that an adequate stock of material be available on shore at many widely separated points. Hence decisions must be made, first, as to how much of each item should be in store and second, where it should be stored. Each navy yard maintains a stock of the particular items that past experience has shown will be requisitioned by ships calling at that yard or will be required by the local shore activities. In addition, there have been established at certain important points, namely Brooklyn, Hampton Roads, and San Diego, naval supply depots where similar stocks are carried.

Yards and supply depots are, in supply department language, designated as "eighteen-month" or "twelve-month" yards or depots. An "eighteen-month" yard or depot replenishes items of stock to a maximum of eighteen months' supply determined from the average issues of the past year and requests replenishment in any case where the stock of any item falls to a quantity equal to a nine months' supply. Similarly, for a "twelve-month" yard or depot, the corresponding figures are twelve and six.

These arbitrary replenishment points and limits may appear excessive, but experience has shown them to be the minimum consistent with efficient supply. As a basic principle of lowest price purchasing it is desirable that items be purchased in large quantities. For this reason routine requests for stock replenishment are submitted to the bureau of supplies and accounts so that all yard and depot needs may be consolidated into one purchase. This procedure takes time, the delivery of the material takes time, and meanwhile requisitions for the stock must be met. Visits of ships at yards and depots and shipment demands follow no set schedule repeated from month to month. Ships usually draw in quantities necessary for a number of months. Hence a shore supply activity's issues of each item of stock is not a day-to-day withdrawal of similar quanties but instead large issues at irregular times. In general, therefore, it has been considered advisable to designate a

minimum of six months' supply and a maximum of twelve as the guide posts for shore supply yards and depots.

At certain points, because of greater activity in issue, remoteness from sources of supply, strategic position with reference to point of purchase or other issuing activity, or for other reasons, the maximum and minimum stock replenishment limits have been prescribed as eighteen and nine months respectively. These points are the naval supply depot, Brooklyn; the naval supply depot, Hampton Roads; the navy yard, Mare Island; the navy yard, Puget Sound; and (normally) the naval station, Cavite, P.I.

Recognizing the economical advantages of centralized quantity purchase, the Navy endeavors, in so far as is practicable, to do its purchasing at one point for all activities. In this respect the Navy may be likened to a chain store. The storerooms on board ship and the final issue storehouses on shore are the individual retail stores of the chain.

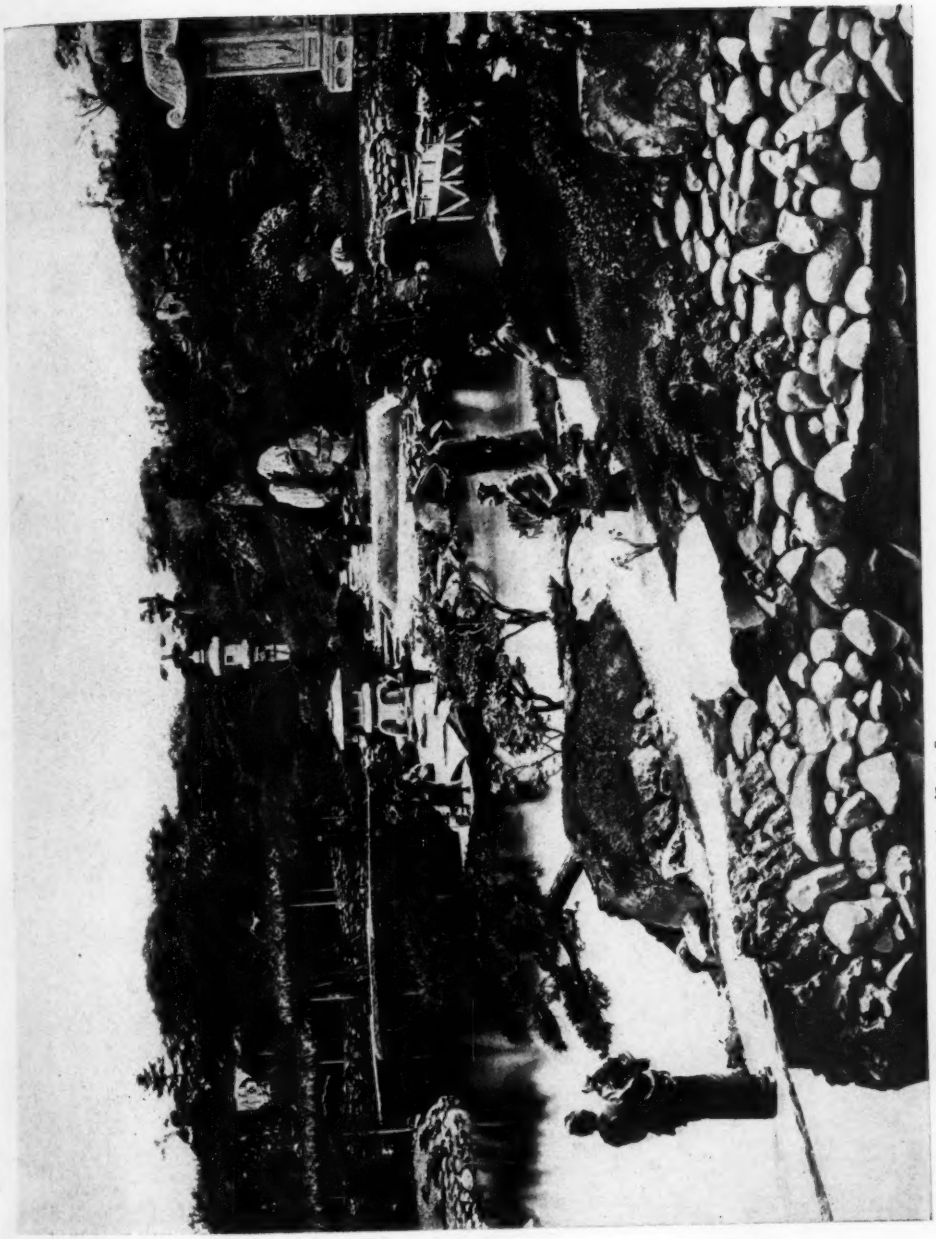
Most of the eighty-one classes of naval stores are assigned a replenishment date twice a year, and for different classes these replenishment dates are adjusted so as to provide an even flow of work throughout the year. For items whose price varies with the season, the replenishment dates are adjusted so as to conform to the usual periods of low prices. On these replenishment dates the bureau of supplies and accounts receives from each supply yard and depot (except Cavite, P.I., and Pearl Harbor, T.H.) stock replenishment requests for the classes of material designated to be procured at that time. These requests furnish information as to the stock on hand, the quantities issued during the last year (corrected by appraisal where it can be foreseen that future issues will be greater or less than in the past), and the amount required to bring the stock on hand up to the maximum limit set for the particular yard or depot. At the same time, each yard or depot reports the items on which there is in store a quantity of any item in excess of the next two years' probable requirements, stating the quantity considered to be in excess. Stock replenishment requests are then checked against excess stocks reported; transfer of excess stock to fill requirements of other activities is ordered; the original requests are reduced accordingly and the quantities advertised for purchase.

In case the stock on hand of any item falls to the minimum at times other than the standard replenishment date, a special request for replenishment is submitted to the bureau. Action on these requests may take the form of directing a transfer of excess stock from another station, directing the supply of the material from a yard having a larger stock, or as a last resort, special purchase of the needed material by the bureau or locally at the requiring station, as seems best.

While the bulk of purchasing is done by the bureau of supplies and accounts, a very considerable amount is done by the field purchasing officers. These purchases are generally limited to local activities. Whether the purchase is made by the bureau or in the field, the same principles apply: advertisement either in the public press or by distribution of proposals and notices posted in a public place; a public opening of bids; award to the lowest bidder meeting the requirements and by written contract or order.

At the end of this cycle of procurement comes delivery of the items requested at the requiring activity, and then the problems of proper storage or warehousing until issue of the material to ships or the nearby naval shore activities. Material storage and warehousing is a field of study in itself, technical and not of particular interest in connection with this discussion. Suffice to say that storehouses must be arranged so that stores are accessible for issue and inventory, and so that they do not deteriorate. Modern and well-planned storehouse structures are essential to this end and while they are available at some points, they are sadly lacking at others; this lack hampers greatly the efficient conduct of Navy supply.

In conclusion, permit again the statement that Navy supply is not a thing of mystery. Throughout its many phases, the methods employed are soundly based on principles that have stood the test of time in the business world. The members of the service, in so far as they are called upon to administer a part of the work of supplying the Navy, endeavor to function as would business men connected with large industrial organizations. Many things are to be considered, many limiting circumstances must be met. Better results are certain if all concerned have at least some conception of the problems and business methods employed and lend their hearty coöperation.



Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

A JAPANESE GARDEN
Which makes one wish to visit Japan.

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

THE LIBERTY PARTY GOES ASHORE, YOKOHAMA, JAPAN, 1908
And this was typical of the welcome extended everywhere in Japan.

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

THE LIBERTY PARTY GOES ASHORE, YOKOHAMA, JAPAN, 1908
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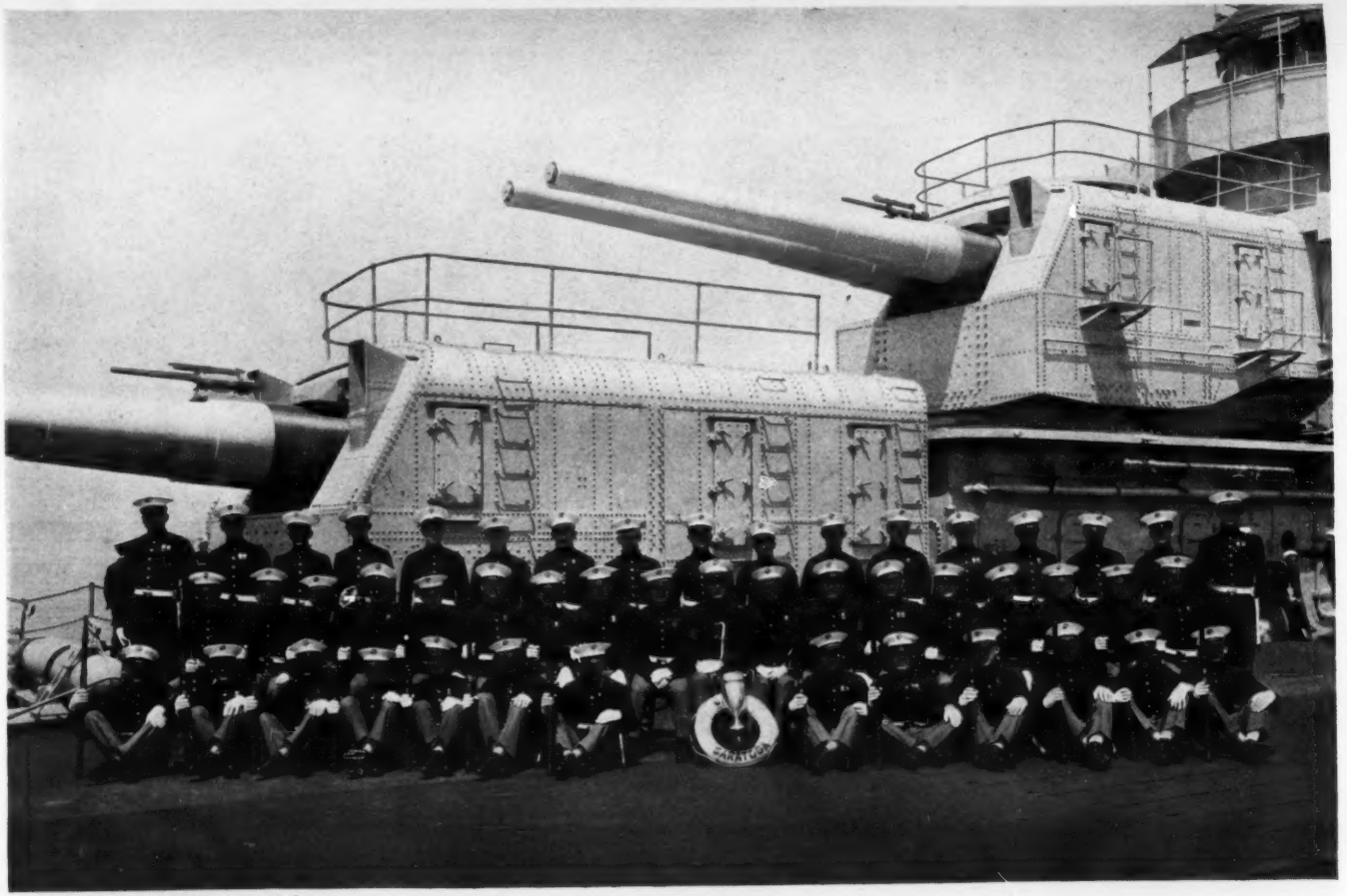

Courtesy Headquarters, U.S. Marine Corps

SOLDIERS OF THE SEA
Marine detachment, U.S.S. *Saratoga*, July 7, 1928. Awarded "General Efficiency Cup."

Courtesy Headquarters, U.S. Marine Corps

"A BLARE OF BUGLES, A RUFFLE OF DRUMS"
Fife and drum corps, 4th Regiment, 3rd Brigade, U.S. marines at Shanghai, China, 1928.

Courtesy Headquarters, U.S. Marine Corps

"A BLARE OF BUGLES, A RUFFLE OF DRUMS"
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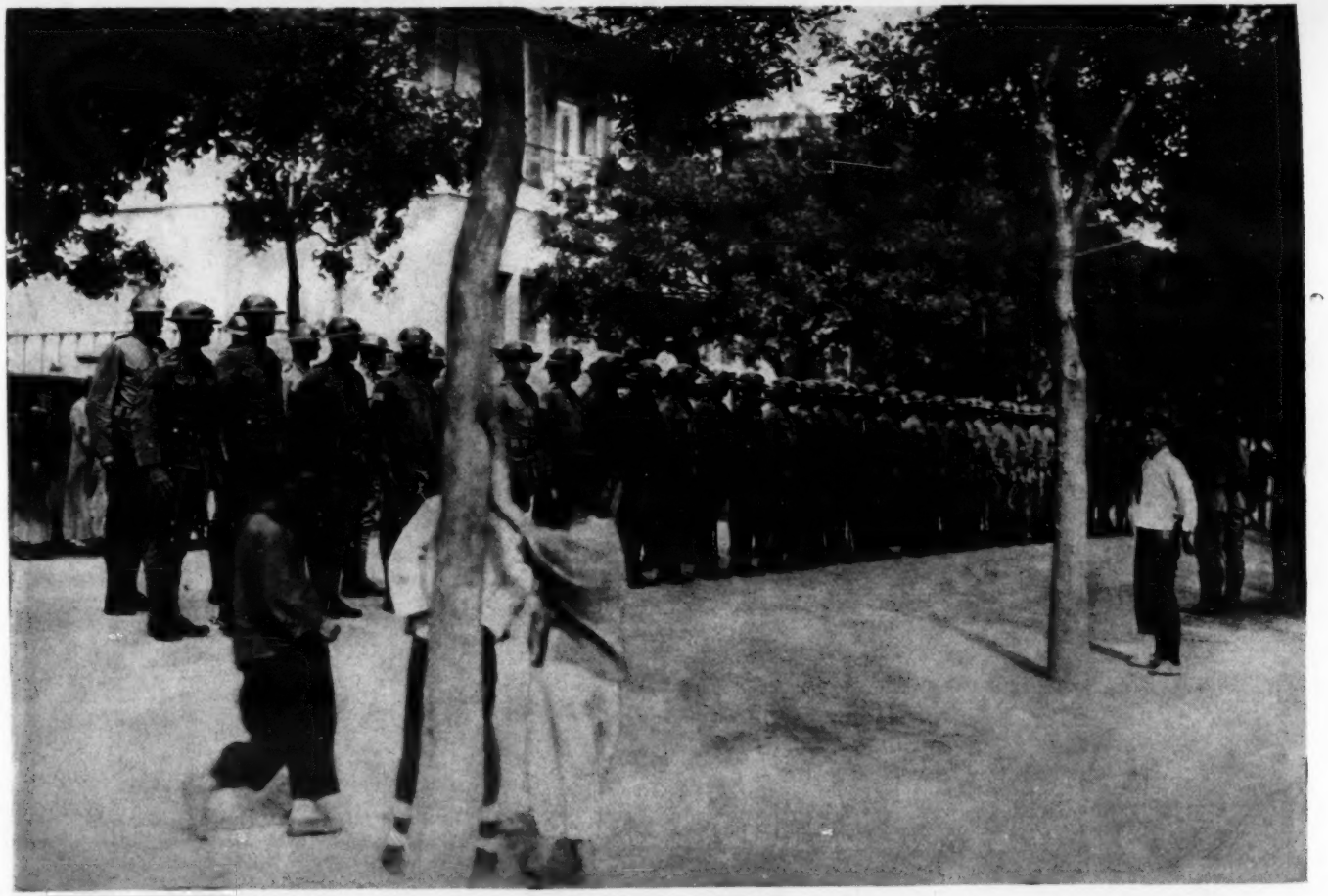


Courtesy Headquarters, U.S. Marine Corps

SEA SOLDIERS ON SHORE
Marines in China, formed for inspection.

Courtesy Headquarters, U. S. Marine Corps

MAKING THE BEST OF A SITUATION
U.S. marines using sampans for landing at Shanghai, China.

Courtesy Headquarters, U. S. Marine Corps

MAKING THE BEST OF A SITUATION
U.S. marines using sampans for landing at Shanghai, China.

Courtesy Headquarters, U.S. Marine Corps

STRANGER THAN FICTION
Chinese view the Marine Corps tanks landed in China.

Courtesy Headquarters, U.S. Marine Corps

MARINES KEEP WATCH AT PEKING

Ready to guard American interests in Peking. U.S. marines of the legation guard are shown on parade on the American glacis, while a part of the Tartar Wall and Chien Men pagoda form a picturesque background. The Tartar Wall was held, in part, by the U.S. marines during the Boxer Uprising of 1900.

The U. S. Marine Corps, Present *and* Future

By Major General Commandant John A. Lejeune,
U. S. Marine Corps

THE distribution of the Marine Corps personnel in round numbers at this time is as follows: within the continental limits of the United States, 6,000; outside the United States, 12,000. The three most important stations outside the United States at the present time are Nicaragua, China, and Haiti. In Nicaragua, we have 240 officers and 4,700 men; in China, 220 officers and 3,800 men; and in Haiti, 80 officers and 600 men. These figures speak for themselves. This distribution has existed for approximately a year and a half, with a few minor exceptions, and is indicative of the demands that have been made on the corps in recent months. The accomplishments of the corps in Nicaragua and China are well known to the public at large, through the prominent place in the daily news that the foreign relations of the United States have occupied. Accordingly, this article will not attempt to deal with the various incidents of the Chinese and Nicaraguan situations in detail.

A few words on the Nicaraguan policy and the present status of the Navy in that republic may tend to clear up some misconceptions as to our position and intentions toward that country, which seem to be more or less general throughout the United States.

The Navy landed marines and bluejackets in Nicaragua for the protection of American lives and property, when that country was in the throes of a political revolution, in pursuance of a long established policy toward our Latin-American neighbors, which, although it often is the subject of political dispute in this country, has nevertheless been pursued in general under the administration of both great political parties ever since the promulgation of the Monroe Doctrine. This policy has justified itself by the results obtained, as the progress and prosperity enjoyed by Cuba, Panama, Santo Domingo, and Haiti at the present time will bear witness.

In short, when the United States forces landed, the Liberals were trying to overthrow the established government (Conservatives) by force of arms. The outcome was in doubt, but the struggle promised to be long and bitter, and the resultant danger to the lives and property of our nationals, as well as those of other countries, made some action imperative. Upon landing, certain zones around important centers were neutralized, i.e., the combatants were denied entry into these areas with armed forces. A conciliatory attitude was adopted toward both contestants and through the good offices of the United States government, they were brought together and agreed to mutually turn in their arms, provided that the United States would supervise a fair election to be held at the expiration of the term of the incumbent president, and in the interim, maintain peace (as the Nicaraguans themselves would have no armed forces). The most responsible persons representing the three parties to this agreement ratified it. The arms of both parties were turned over to the forces of the United States, with the exception of a certain dissenting element of the revolutionists (Liberals), who withdrew, contrary to expectations, and have since been the cause of unrest, disorder and brigandage in the sparsely settled northern region of the country.

In accordance with the terms of the so-called Stimson Agreement made in May, 1927, with General Moncada, the commander of the Liberal forces, the president, Diaz, it became the duty of the United States government in addition to holding a fair and orderly election in the autumn of 1928, to recruit, organize, and train a non-partisan *guardia nacional* which should eventually be the sole military and police force in Nicaragua. The *guardia nacional*

Tartar Wall and Chien Men pagoda form a picturesque background. The Tartar Wall was held, in part, by the U.S. marines during the Boxer Uprising of 1900.

under the command of officers and non-commissioned officers of the Marine Corps and officers and petty officers of the medical corps of the Navy has already made great progress and now has a trained enlisted personnel of about 1,500 Nicaraguans. It has taken over the policing of the cities of Managua, Leon, Chinandega, Grenada, Masaya, Matagalpa, Jinotega, and several of the provinces. Its personnel has also served with the marines in Neuva Segovia and has displayed both efficiency and courage.

Pending the readiness of the *guardia nacional* to assume full responsibility for the policing of the country, it developed upon the Second Brigade, U. S. Marine Corps, to maintain peace and tranquility. It was anticipated that this would merely involve "sitting on the lid," and making a show of force if necessary. However, the unexpected turn of affairs, brought about by the failure of Sandino and his followers to turn in their arms, and the hostile steps which they took toward the Nicaraguan and United States governments, necessitated an active campaign to accomplish the disarmament and dispersement of these forces. This task has been one of almost insurmountable difficulties, due to the rugged, wild, and inaccessible nature of the country in which the operations have been carried on.

It is interesting to note here that the armed forces of the United States have no military or civil authority in Nicaragua, except in so far as they have the power to maintain peace and effect disarmament in accordance with the agreement before mentioned. Thus, disarming and dispersing individuals or groups that are actually armed, is the limit of the functions of the United States forces; potential enemies, political malcontents, and agitators may pursue their own devices without restriction, except that which may be imposed by officials of the Nicaraguan government. This condition is mentioned with the desire to emphasize the fact that the United States in no way has unrestricted military control in Nicaragua.

Without a doubt, every one is familiar with the events leading up to the dispatch of the marines to China for the protection of our nationals in the early spring of 1927. This well-equipped force, organized as the Third Brigade, has remained at the disposal of the commander-in-chief of the Asiatic fleet. At the present time, one regiment is in Shanghai, and the remainder in Tientsin. Although the brigade has engaged in no active operations, its mission has thus far been accomplished.

The First Brigade in Haiti has continued its functions as a garrison force, for the preservation of peace in that country, and is coöperating with the other branches of the Navy Department and of the United States government, and with the Haitian government itself in promoting the progress which has been the outstanding feature in the history of that republic since the American intervention in 1915.

The unusual demands made upon the corps in the last year and a half, due to the simultaneous requirement for forces in China, Nicaragua, and Haiti, have necessitated greatly curtailing the strength of the navy yard detachments and other activities within the United States. The recent call for 1,200 additional men for training and assignment for the detailed work involved in the actual mechanism of the forthcoming election in Nicaragua, caused temporary withdrawal of the marine detachments from nearly all the ships of the fleet. As sea duty is such a valuable asset in the training of marines, this step was taken with great reluctance, but it has been decided to preserve the integrity of these detachments, in order that they may be returned to their ships as soon as the situation warrants.

An article of this kind would be incomplete without mentioning the highly important rôle that the aviation section of the Marine Corps has performed. The important part played by this branch of the service in the operations in Nicaragua cannot be too highly emphasized. This is the first opportunity that the United States armed forces have had to test the actual value of aircraft under the peculiar and trying conditions that exist in a tropical and mountainous country, with unfavorable meteorological conditions, such as is the case in Nicaragua. The scope of this article will not permit me to go into the details of these operations. Suffice it to say that in combat and reconnaissance and in the practically new military phase of transport, airplanes have proved themselves to be of immense value.

My preceding remarks have been intended to give a summary of the present activities

of the Marine Corps. The corps, being a component part of the naval service, is assigned a mission, which, in general terms, is to furnish an expeditionary force to the fleet, to enable it to seize and hold the necessary overseas territory for fleet bases and bases for overseas land operations, with secondary missions in peace and war of furnishing ships' detachments, navy-yard guards and overseas expeditionary forces for minor shore operations, such as those now being conducted in Nicaragua and China. The future of the corps is dependent upon its ability to accomplish this primary mission successfully. Its efforts in peace time are directed toward fitting itself for the efficient accomplishment of the mission in all its phases.

The school of experience, which the officers and men of the Marine Corps are going through on foreign shores, will be of the greatest value not only to themselves, but to their comrades who, of course, will be able to draw valuable lessons from a review of the methods used and the results accomplished. It is the aim of the Marine Corps not only to keep abreast of the progress of the other branches of the naval service, in so far as this progress applies to the Navy as a whole, but to continue also the development of those phases of its activities which might be said to apply particularly to the marine in his relation to the naval establishment. To this end, the Marine Corps schools and the various schools conducted by the Army and Navy, which marine officers attend from time to time, are used to the greatest practicable extent.

A vital factor in the future of the Marine Corps, as affected by the efficiency of its officer personnel, is the subject of promotion and elimination. The lack of promotion tends to deaden ambition; and excessive age in grades lessens efficiency, especially in junior grades. Means must be found to secure a normal advancement in the grades for the individual. Legislation which accomplishes this and at the same time protects the individual's rights and the interests of the government, is now pending.

In addition to the military and naval training of the Marine Corps outlined in the preceding pages of this article, a consistent effort is made to build up and maintain a high *esprit de corps* among both the commissioned and enlisted personnel; also to instil in their minds the conviction that no task is so difficult as to be beyond their capacity to perform successfully; and that the corps is a great school for the training of American citizens, in which men have the finest kind of an opportunity to serve our country with efficiency and fidelity both in peace and in war.

The Hydrographic Office

A Service of Security for Mariners and Aviators

By CAPTAIN CLARENCE S. KEMPFF, *U. S. Navy*
Hydrographer
and COMMANDER FRANK H. ROBERTS, *U. S. Navy*
Hydrographic Office

FROM the time man first ventured upon the sea he has appreciated the need of the knowledge which would enable him to complete his voyages in safety. Urge of sea venture and travel has always been strong in our people.

At the present time travelers go forth in ships to find rest and recuperation, with a feeling of security. It may be of interest to understand what has been done to produce this feeling.

Congress maintains the Hydrographic Office in the Navy Department, primarily to promote general maritime security. Founded in 1830, its activities have been benefiting the world for nearly a century, during which time great progress has been made, and many illustrious names have been associated with its advancement.

The Hydrographic Office is a manufacturing plant which includes a remarkable and irreplaceable library, a research organization, a producing organization of maritime information and security, a photolithographic and copper engraving plant, an editing department, a large distributing department, and an administrative department having all the correspondence and records received since the institution of the office. It is the United States repository of nautical information of the world and is the scientific agency to which the citizens and the government look for authentic maritime information. Its activities are constantly expanding in volume and value.

The Hydrographic Office has always been administered in Washington, D.C. As it primarily deals with mariners, Congress has from time to time instituted the branch hydrographic offices now located at Boston, New York, Philadelphia, Baltimore, Norfolk, Savannah, New Orleans, Galveston, San Juan, P.R., San Pedro, San Francisco, Portland, Ore., Seattle, Sault Ste. Marie, Duluth, Chicago, Detroit, Cleveland, and Buffalo. Each is a center for its local area, as well as a distributing point for all information issued from the main office, and maintains for reference purposes a complete library of Hydrographic Office publications and charts corrected to date. The naval officer in charge and trained assistants are frequently consulted on matters concerning the sea.

The Navy maintains three ships, the U.S.S. *Hannibal,* U.S.S. *Nokomis,* and the U.S.S. *Niagara,* together with a three-plane aviation unit, V. J. Squadron 3-S, for special survey duty with the Hydrographic Office.

SOURCES OF INFORMATION

The sources of hydrographic information are world wide. The office archives contain information from all portions of the globe. Even now preparations are underway to obtain scientific data of the Antarctic regions and the approaches to the South Pole.

Hydrographic Office data are divided into two general classes: first those considered of a more or less permanent nature; and second, those of temporary value only. In the first class are its charts, nautical tables, and books; in the second class are its daily and weekly publications, and radio broadcasts. The three survey vessels are now employed along the coasts of Cuba, Gulf of Panama, and occasional Central American harbors. These ships produce surveys of a high degree of accuracy and each surveys

ORGANIZATION CHART OF THE HYDROGRAPHIC OFFICE, NAVY DEPARTMENT
HYDROGRAPHIC OFFICE, U. S. NAVY
HYDROGRAPHER
Naval Officer
DIVISION
ADMINISTRATION
Aide to Hydrographer, Naval Officer
Administrative Assistant, A. F. Rogers
SECTION
FILES AND ARCHIVES
H. A. Baldwin
DIVISION
NAUTICAL RESEARCH
SENIOR SCIENTIST
E. W. Littlehales
SECTION
FINANCE AND SUPPLIES
SALES AND PERSONNEL
A. F. Rogers
19 BRANCH
HYDROGRAPHIC
OFFICES
Naval Officer
In Charge
SECTION
SUPPLIES
C. L. Hough
DIVISION
CHART CONSTRUCTION
Naval Officer
In Charge
SENIOR ENGINEER
J. H. Lonsdale
OCEAN
AND
LAKE SURVEYS
Survey Ships
SECTION
CONSTRUCTION
A. Stirling
SECTION
COMPILATION
H. P. Simpson
SECTION
RECONSTRUCTION
W. H. Driscoll
SECTION
ENGRAVING
R. A. Baker
SECTION
DRAFTING
E. F. Goldsmith
SECTION
PANTOGRAPHER
W. C. Cuomo
SECTION
LITHOGRAPHY
A. E. Weeks
SECTION
AVIATION CHARTS
T. P. Lanza
SECTION
TRANSFER
G. A. Humphrey
SECTION
LITHO. PRINTING
C. F. Dow
SECTION
LITHO. DRAFTING
H. F. Aldridge
SECTION
PLATE PRINTING
M. W. Fernandez
SECTION
PHOTOGRAPHY
W. S. Yeckman
DIVISION
MARITIME SECURITY
Naval Officer
In Charge
SECTION
NAUTICAL DATA
W. C. Hogan
SECTION
SAILING DIRECTIONS
J. B. Hurt
SECTION
LIGHT LISTS
RADIO AIDS
J. R. Hanley
SECTION
PILOT CHARTS
A. B. McKenna
SECTION
NOTICE TO MARINERS
M. L. Rojahn
SECTION
OCEAN ROUTES
Naval Officer
SECTION
AERIAL NAVIGATION
Naval Officer
SECTION
STATIC AND STORMS
Naval Officer
DIVISION
DISTRIBUTION
Naval Officer
In Charge
SECTION
AVIATION
DISTRIBUTION
Naval Officer
SENIOR
ASSISTANT
F. C. Rolle
BOOKS, RECORDS
ISSUE
F. C. Rolle
CHART STOCK
CATALOGS
J. E. Merryman
MAILING
LISTS
J. A. Montgomery
APPROVED: 26 June, 1937
Captain, U. S. NAVY
Hydrographer
H. O. Print

an area of approximately 2,000 square miles a year.

By direction of the President, the coastal waters of the United States and its possessions are surveyed by the U. S. Coast and Geodetic Survey of the Department of Commerce. Before the Spanish-American War, naval officers were detailed to that organization, during which period both coasts of the United States and parts of Alaska were charted. Because of the expansion of its activities during and after the Spanish-American War, the Navy withdrew its personnel from duty with the Coast Survey which, since that time, has built up a commissioned corps of its own. To prevent duplication of effort the Hydrographic Office is now primarily interested in surveying foreign waters.

Foreign nations, particularly the English, Dutch, German, French, Russian, Spanish, and Japanese, have well-organized survey expeditions attached to their naval establishments. A mutual exchange furnishes much information of value that could be obtained in no other way.

Information of all seaports of the world, commercial sea lanes, and strategical areas, is obtained from thousands of trained observers with whom the Hydrographic Office is in contact. Among these may be noted the American diplomatic, consular, military, and commercial services, enthusiastic yachtsmen, and officers of the commercial fleets of all nations.

The Hydrographic Office greatly appreciates the efforts of the talented seamen in our own services who take occasion to further the interests of the office. Their reports are of exceptional merit, due to the background of the officer concerned. Investigation and report upon phenomena pertaining to the oceans are frequently made by scientific organizations. At the present time the Carnegie Institution of Washington is financing a three-year cruise of the non-magnetic ship *Carnegie* over all oceans. The Hydrographic Office will be particularly interested in the results of the *Carnegie's* observations of magnetic variation, sonic depths, water temperatures, and upper air currents. The French maintain the S.S. *Jaques Cartier* at sea for meteorological observations and reports. The Dutch have recently made gravimetric measurements by delicate instruments installed within a submarine which circumnavigated the globe. Cable ships of various nationalities are constantly furnishing accurate soundings of ocean depths.

The United States is one of the twenty-two members of the International Hydrographic Bureau, Monaco, Europe. The bureau is endeavoring to standardize symbols and methods used by its members. It is also a central clearing house of nautical information, obtained from individual states, and furnished to all. It issues nineteen special publications on technical subjects. Its reports, publications, and exchanges are of great value.

A comprehensive study of increasing value is made of ocean currents by means of drifting bottles containing Hydrographic Office papers with instructions in eight languages to insure their return from any part of the world.

The results of these bottle papers have been interesting and show drifts of from five miles to 15,000, covering periods of time from two days to six years. It is interesting to note that one bottle, thrown overboard southeastward of the Cape of Good Hope, was recovered on the west coast of Chili, having drifted about 8,800 miles, about one-third the distance around the world. Another drifted from southeastward of Cape Horn to the west coast of North Island, New Zealand—about 10,250 miles.

Hydrographic Office Production Plant

From the organization chart, here pictured, it will be noted that the Hydrographic Office is divided into five main divisions, which are further subdivided into twenty-nine sections, all of which are essential for the reception, sifting, production, and distribution of authentic hydrographic data.

Eleven commissioned line officers and one hundred and sixty-four civil service employees comprise the personnel. The pay roll of the civil service personnel amounts to approximately $385,000 per year. This force includes mathematicians, scientists, engineers, mechanics, clerks, and laborers. The mathematicians solve, check, and calculate the formulæ and figures required in chart construction, in determining magnetic variations, in preparing nautical tables, and physical problems of the sea. The scientists investigate and prepare for publication facts

and formulæ of oceanography, depths, circulation of water, configuration of ocean bottoms and boundaries, temperatures, and also the circulation, pressures, temperatures, and physical characteristics of winds at the surface and upper air levels. The engineers are skilled cartographers and draftsmen. The mechanics handle the physical problems of chart production and include such skilled ratings as copper engravers, lithographers, photographers, and pressmen.

A synopsis of the work involved in the production of nautical charts is here presented:

Data from which charts are constructed.

U. S. naval surveys.
Foreign surveys as presented in foreign charts.
Surveys by commercial interests.

Construction and compilation sections:

Investigation of data.
Preparation of specifications for the chart.
Computations of projections and scales.
Determination of detail of hydrography to be shown on the chart.
Translation and arrangement of nomenclature.

Drafting section:

All drafting work incident to the construction of the chart.
Selection of soundings to be used and delineation of fathom curves.
Drawing of hillwork.

Engraving section:

Laying down and engraving projection, border, and scales on copper plate.

Photographic section:

Making of photo negatives of the chart for use on pantograver.

Pantograver section:

Engraving on the copper plate, by means of the pantograver, outlines of the chart, soundings, lettering, and such other features as can be mechanically engraved.

Engraving section:

Machine engraving of titles and notes.
Hand engraving of all features not engraved by pantograver, such as sand beaches, reef, bluff, and mangrove symbols, and fathom curves. Proofs from engraved plates are revised by construction or compilation sections at various stages of the work.

Lithographic section:

An impression of the chart, known as a mounted original, is printed from a copper plate by a process which produces a clean, sharp copy free from distortion.

Drafting section:

Features subject to frequent change, such as light sections, tracks, and variation curves, are drawn upon a mounted original.

Photographic section:

Negatives made of mounted original.
Negatives painted out and recut.
Negatives photo-printed to zinc plate.
Negatives blue-printed on zinc plates for color plates.

Lithographic transfer section:

Receives zinc plate, with chart photo-printed on it. from the photographic section.
Transfers compass roses, publication note and seal.

Lithographic drafting section:

Draws borders on zinc plate and touches up work along joints between negatives.
Draws color plates for tinting land and water areas and coloring lights.

Lithographic transfer section:

Etches and prepares zinc plates for printing.

Lithographic pressroom:

Prints the charts on offset and flat-bed presses.

Reconstruction section:

Charges all information received in office to charts affected. Prepares correction sheets for charts down for print.

Lithographic section:

Receives correction sheets from reconstruction section and corrects zinc plates accordingly before printing.

In addition to nautical charts, the Division of Chart Construction produces: aviation charts, anchorage charts, range finder testing charts, radio compass charts, strategic plotting charts, cable, time-zone, and meteorological charts, pilot charts, ice supplements, illustrations for H. O. publications, and other miscellaneous work.

The Division of Maritime Security prepares the following publications:

Fifty-eight volumes of *Sailing Directions (Pilots)*.
Six volumes of *Light Lists* of all oceans and seas and of foreign coasts, islands, and harbors.
Radio Aids to Navigation, an annual publication, includes details of radio compass stations, radio beacons, weather bulletins, storm and navigational warnings, time signals, etc.
The Naval Air Pilot.
Pilot Charts of all oceans.

Commencing with December, 1927, a monthly *Pilot Chart of the Upper Air of the North Atlantic* has been presented. One of the North Pacific Ocean is in preparation. This chart is a valuable aid to aviators on oceanic flights. The *Upper Air Pilot Chart*

contains data at the surface and at levels of 2,500, 5,000, and 10,000 feet above the sea level. It was the first chart of its kind published and is the pioneer in its field. Other nations are adopting the idea.

The following are issued periodically.

Notice to Mariners. Gives weekly changes in aids to navigation (lights, buoyages, harbor construction), dangers to navigation (rocks, shoals, banks, bars), important new soundings, and, in general, all information affecting mariners' charts, manuals, and *Sailing Directions.*

Extracts from Notice to Mariners. Contains all information published in *Notice to Mariners* affecting the navigational aids and dangers on the Great Lakes.

Hydrographic Bulletin, issued weekly, gives more detailed facts than the pilot charts regarding ice, wrecks, and derelicts; also items on port facilities, use of oil to calm the sea, and miscellany of use and interest to mariners.

Ice Supplement to the Hydrographic Bulletin. A chartlet presenting graphically all late reports of ice. Issued weekly with the *Hydrographic Bulletin* when conditions make it necessary.

Daily Memorandum. Contains reports affecting safe navigation, such as advance notices of the more important information concerning dangers and aids to navigation that will appear in the *Notice to Mariners,* the location of icebergs, derelicts, obstructions, and other news of sufficient importance to publish daily. The most urgent of these items are broadcast by radio.

Mine Warnings. Contains notices of mine fields, supplemented as necessary by charts defining mine areas.

Supplements to Sailing Directions (Pilots). Published annually and includes all important information from reliable sources received in the Hydrographic Office since the publication of the latest edition of the *Sailing Directions.*

Notice to Aviators. A monthly publication, giving information to aviators which is of assistance to them in the navigation of the air; also information concerning air harbors, air routes, the establishment and maintenance of aids to the navigation of the air, scientific articles on the development of aërial navigation and other information of value and interest to aviators.

Reprints of Hydrographic Information. Pamphlets designed to keep in handy form articles and information scattered through the pilot charts and bulletins.

In this division the time of one line officer is wholly devoted to an analysis and research of ocean routes, the results of which are being published in recent editions of the *Sailing Directions.* The time of another line officer is taken up wholly with the investigation of the relation of static to storms. The time of another line officer is wholly occupied with the field of aviation charts and aërial navigation. This officer is a qualified aviator so that the aviation charts and information now being produced meet the practical requirements of aviators in a simple, yet comprehensive, way.

The Division of Nautical Research is responsible for manuals and tables, among which the following are published:

American Practical Navigator. (Bowditch)

Useful Tables from the American Practical Navigator (being Part II of *Bowditch*).

Arctic Azimuth Tables for parallels of latitude between 70° and 88°. The values of the azimuth are given at intervals of ten minutes for six hours out of the twenty-four —that is, in the case of the sun, from 5:00 A.M. to 8:00 A.M. and from 4:00 P.M. to 7:00 P.M. The tables are applicable in both the northern and southern hemispheres, but only for bodies whose declination is of the same name as the latitude and within ecliptic limits.

Azimuth Tables, giving the true bearings of the sun at intervals of ten minutes between sunrise and sunset, for parallels of latitude between 71° N. and 71° S. These can also be applied to the moon, planets, and stars as long as their declinations do not exceed 23° N. or S.

The Azimuth of Celestial Bodies whose declinations range from 24° to 70°, for parallels of latitude extending to 70° from the equator.

Star Identification Tables, giving simultaneous values of declination and hour angle for values of latitude, altitude, and azimuth ranging from 0° to 80° in latitude and altitude and 0° to 180° in azimuth.

Altitude, Azimuth, and Line of Position. Noon Interval Tables.

The Sumner Line of Position, furnished ready to lay down upon the chart by means of *Tables of Simultaneous Hour Angle and*

Azimuth of celestial bodies of declination 27° N. to 27° S., latitude 60° N. to 60° S.

The Sumner Line of Position, furnished ready to lay down upon the chart by means of *Tables of Simultaneous Hour Angle and Azimuth* of the navigational stars between 27° and 73° of declination from the celestial equator, for latitudes ranging from 60° N. to 60° S.

Development of Great Circle Sailing.

Tables of Distances. (About 8,000 shortest navigable distances between ports.)

Research by this division is along highly technical and mathematical lines. Its work has kept the fleet supplied with nautical tables and manuals that are up to date and in many cases are in advance of the times. There is now being prepared for the printer a table of small size and few pages. It is the equal of any now in existence in solving navigational problems accurately and promptly. It has a larger range of use than any similar table. It will be valuable to aviators in planning and conducting ocean flights. It will also be useful to navigators of surface vessels as with it and a nautical almanac any problem may be solved quickly.

Method of Distribution

With money appropriated by Congress in the annual Navy appropriation bill, ships of the U. S. Navy are furnished free with all Hydrographic Office products direct. The merchant marine and navigators generally are furnished with these products at the cost of printing and paper through Hydrographic Office agents at the various seaports or from the main office direct.

Under the system now in vogue, estimates for future expenditures are submitted, carefully examined by the Bureau of the Budget and acted upon by the appropriation committee prior to submission to Congress. Estimates are being prepared now for appropriations which will become available July 1, 1930; the money which is now available for expenditure is the outcome of estimates prepared two years ago. Consequently, new and sudden demands made upon the Hydrographic Office funds can only be honored by the elimination of some item for which estimates were originally prepared. It is difficult to meet new situations where a sudden demand involves a large expenditure of money, such, for example, as that necessitated by a recent demand for Army Strip Maps which now cost the Hydrographic Office twenty-five cents each. The number requested is becoming so great that the current appropriation is inadequate to fulfill the demand.

Data are placed in the hands of the mariner by mail, by radio, through agents at the principal maritime seaports of the United States, by lectures, and by interviews.

Within the Hydrographic Office is a large Division of Distribution which maintains an adequate supply of all charts and publications corrected to date. There are fourteen employees engaged solely in the work of keeping the stock supply corrected in accordance with the latest *Notice to Mariners*. The value of the stock on hand available for distribution is approximately $350,000, and includes 475,000 chart copies and 85,000 publications.

Service, to be effective, must be prompt. Realizing this, deliveries are carefully planned in advance and the work of the whole Hydrographic Office is coördinated to this end. The schedules of daily, weekly, and monthly dispatching have been so consistent in the past, and so well maintained at present, that the various channels of distribution throughout the country anticipate the arrival of hydrographic information. Cases are frequent where interested parties proceed to Washington to obtain certain publications as soon as they come off the press.

The Division of Maritime Security broadcasts, twice daily, information concerning dangers to ships approaching our coasts, such as floating derelicts, floating buoys, changes in characteristics of lights and light vessels, positions of floating ice, floating wreckage, and other aids or obstructions to navigation which, if unknown, might result in loss of life and property.

The Navy maintains twenty commissioned line officers and twenty-four civil service employees at the branch hydrographic offices. In addition to having a complete library of correct charts, publications, and reference books of value to mariners, personal acquaintance is made with the officials and officers of the steamship lines and vessels making port. Facts of interest and reports of the voyage are obtained from the ship officers, and they in turn are given the latest general information and any special in-

formation desired. On the Great Lakes during the open season, cargoes of immense value and quantity are transported by water. Five of the branch hydrographic offices are located on these lakes. Their activities are coördinated and a complete Great Lakes' service of weekly *Notice to Mariners* and *Daily Memorandum* is furnished. During the season when the lakes are closed with ice, the branch hydrographic offices are used to instruct merchant officers in navigation.

The officers taking the postgraduate line course of instruction at Annapolis are given an annual series of six lectures on the Hydrographic Office. This beneficial contact should increase interest and knowledge of hydrographic matters among officers afloat.

It is difficult to describe all of the activities of the Hydrographic Office by which its service of maritime security is maintained, due to the many different technical fields involved. To mention some of last year's output: 600,000 copies of various charts were issued; about 1,000,000 corrections were placed upon charts by hand to show various changes in navigational aids or new discoveries of dangers; 1,600,000 copies of notices of interest to mariners affecting security were issued from the main office, 414,000 being issued to shipping on the Great Lakes by the branch offices situated there; 455,000 copies of the notices were issued by the other branch offices. Hydrographic ice information to guard shipping from disaster such as befell the *Titanic* in 1914 is another function of security.

An admiral recently stated that during a voyage along the west coast of Africa years ago when it was poorly charted, the coast was lined with wrecks, and the ship he was on was threatened with danger. The value of accurate charts to security is most important. To visualize the value of such information to the mariner, consider the service stopped. At the end of one year about 2,500,000 copies of essential security information would be lacking, 1,000,000 changes on charts would be missing and the charts would become misleading. The mariner would live in a world of surprises. The *Sailing Directions* would tell a false story of coasts and harbors and approaches thereto. Seagoing would be a dangerous venture indeed; confidence would cease and uncertainty in navigation prevail.

The Hydrographic Office covers a broad field of usefulness to our Navy, our merchant marine, and mariners in general. Its growth has been normal and steady, its friends loyal, its support adequate, and its motto, "Service for Maritime Security."

Early History *of the* Washington Navy Yard

By Rear Admiral W. D. Leahy, *U. S. Navy*
Chief of the Bureau of Ordnance

THE Washington navy yard and naval gun factory, which was established in its present location in 1800, was until 1886 maintained as a building and repair yard for ships and equipment of every description.

Since 1886 its activities have been exclusively concerned with the production of naval ordnance, and it has developed into a great industrial institution wherein difficult development problems in ordnance are studied, investigated and solved by the latest scientific methods of research, and where all the modern ordnance of the Navy has been developed and produced.

Space does not permit of giving here even a brief sketch of the history of this essential element of the national defense, but the following incidents taken from *A History of the Washington Navy Yard,* prepared in 1889 by Chaplain H. B. Hibben, U. S. Navy, and covering the period from 1800 to 1861, may be interesting as further evidence that "the Navy ain't what it used to be, and never was."

In February, 1799, the Secretary of the Navy, Stoddert, in an eloquent appeal to the House of Representatives, induced Congress to appropriate $1,000,000 for the building of six of the largest ships of war to meet the emergency arising from French aggression upon our commerce. To speed up the completion of these ships, together with the design of creating a permanent fleet, the Navy Department applied a portion of the appropriation to the purchase and improvement of grounds for six navy yards, Boston, New York, Philadelphia, Portsmouth, Norfolk, and Washington. The Washington navy yard, consisting of forty acres of land, was originally purchased for $4,000 on Eastern Branch of the Potomac. For years this yard was regarded as of the first importance, and the one most useful, convenient and necessary to the government and the Navy Department.

The shipbuilding activities were placed convenient to the wharves, building slips and canal, in order to reduce transportation of heavy weights. The shops were located opposite the head of the land, forming an open square, in the center of which was placed the office. The commandant's house was located in the center of the yard in order that he might have the whole "under his eye." The captain of the yard's house, built in 1801, was occupied by Captain Cassin, and was also located on higher ground. The master artificers' houses were placed in view of the captain and of the commandant, and at the same time so as to "have a perfect inspection of all shops and stores from their south fronts."

Captain Tingey, first superintendent of the yard, was ordered to duty in connection with the building of the seventy-four gun ship. At the same time he assumed additional duty as naval agent, thus increasing his authority and responsibility, his pay being increased to that of captain commanding a thirty-two gun ship or better, which amounted to $100 per month and eight rations per day.

In March, 1801, Congress passed an act providing for a peace establishment. "Upon the assumption that a powerful navy is a continuous challenge to war, Congress proceeded to emasculate it" by this peace act. Among other provisions, all naval officers were discharged except nine captains, thirty-six lieutenants and 150 midshipmen; all ships and vessels of the Navy were sold except thirteen frigates, of which six were kept in active commission and seven in ordinary. When President Jefferson retired, "leaving the legacy of a war with Great Britain to his successor, what was left us of Navy saved the country at

least from entire and absolute humiliation, and possibly from political destruction."

Captain Cassin, having been ordered to command the ships in ordinary, objected to assigning a few men to each ship in ordinary and requested that they be segregated as a unit for duty and assigned to the yard, being quartered on one ship. His objection to the previous arrangement was as follows:

First. A squadron of men being on board each ship, there must necessarily be a fire for heating and cooking purposes, and in proportion to the number of fires is the danger from suffering from them. Under the present system we consume annually about 130 cords of wood and 1000 bushels of coal.

Second. The officers have little or no employment and our experience has demonstrated that even good officers will degenerate if not actively employed. Time is lost in collecting men scattered among the various ships when their general presence is required. Much time of the men is unavoidably employed in cleaning up their own dirt, and dirt is a powerful auxiliary in rotting a ship. While at sea, the warrant and petty officers have important duties to discharge, but ships in ordinary, having been dismantled, in the absence of rigging, sails, cables, spars, guns, etc., none of these officers have a single article under their charge.

Lastly. Experience has evinced the inexpediency of requiring masters to perform the duties of pursers.

Records indicate that in November, 1793, "by order of President Jefferson, we suppose as a practical exemplification of his method of securing peace, 100 gun carriages of the largest size were shipped to His Serene Highness, the Emperor of Morocco. In the new era of peace and fraternity about to be inaugurated warships would be useless, therefore these gun carriages were taken from our frigates lying in ordinary and rotting in Eastern Branch." Captain Tingey each week supplied the Navy Department with information concerning the activities in the minutest detail. This was done in his own handwriting and particular style and was never delegated to others. The following, addressed to the Secretary of the Navy, is a specimen of old-time style:

Navy Yard, Washington, 12th August, 1805.

Sir: The business of the Frigate *Adams* having been fully accomplished here, I have to request your assent to my absence on my private business in Jersey, which has suffered something for want of personal attention. I conceive that my presence at this yard may as well be dispensed with, at this juncture as at any time for the remainder of this year, and the time of my business will very little exceed three weeks, certainly within four.

I have the honor to be very respectfully sir,
Your obedient servant.

In December, 1805, upon the recommendation of President Jefferson, Congress appropriated $250,000 to build gunboats, not exceeding fifty, "for better protection of harbors, coast, and commerce of the United States." Mr. Jefferson's "pet idea," as it was critically termed by his opponents, and which Congress adopted, was that in place of a Navy there should be a system of gunboat defense of harbors and coasts. The gunboats were to be kept housed in sheds or drydocks in time of peace, and in war were to be manned and officered by seamen or militia, who were ready to volunteer for the purpose, belonging to the town or locality attacked. No fortifications were required for harbors, as these were also to be protected by a sort of flying artillery carried about from place to place as needed.

But the old Navy still continued to have some fast friends in Congress and in the latter part of the year 1805 Congress appropriated a sum of money, not to exceed $660,000, to build six line-of-battle ships.

In March, 1808, Congress enacted a law in relation to the emoluments to which officers attached to navy yards and other stations were entitled. The law seemed in some respects to be lacking in clearness. Among other points it left in doubt whether light and fuel were included in the perquisites allowed to officers attached to the Washington navy yard. Since Captain Cassin had given a practical interpretation of this law by actually appropriating the articles above named to his own private use, charges were preferred against him for using government fuel and candles. The court of inquiry decided that by fair interpretation of the act the aforesaid officers were entitled to these perquisites.

In the summer of 1809, a few specimen circular skylights of solid glass, manufactured at Boston, were introduced at the navy yard for the first time. All that were on hand, to the number of six, were immediately appropriated by Captain Decatur for his ship, the *United States*, to the great disappointment of the officers in command of the other ships in commission. The Secretary of the Navy, however, approved the invention, and ordered it to be supplied to all ships.

But, though successful in securing new skylights, Captain Decatur was not satisfied with his ship in all respects and in an offi-

cial document addressed to the Secretary of the Navy he found fault with the lower rigging. The complaint being referred to the commandant of the navy yard, Captain Tingey expressed his sorrow "that the Secretary should be troubled by such unpleasant representations, but that he could suggest no remedy until a systematic scale is adopted for all spars, riggings, and equipment of the ships, according to rate and size, from which no officer shall deviate. Officers are now guided each by his own opinion and my opinion is that the lower rigging of the *United States* is made sufficiently large, though I have no desires that my judgment shall be binding on other officers against their own."

Ships were supplied with a small number of rifles which were purchased in Baltimore. The pistols with which these frigates were supplied were manufactured at the navy yard. At different periods in the history of this navy yard, up to the disastrous destruction by fire in 1814, there were experimental efforts made to manufacture within the yard not only armament, but every piece of nautical mechanism required by a man-of-war.

In commenting upon the work done on the ships *Wasp* and *Hornet*, the following note is included:

> The *Wasp* was built at this yard by the workmen on daily pay at the very same time that the *Hornet* was built by contract in Baltimore, and by the same draught. It has been authoritatively stated that the *Hornet* is so rotten as to necessitate complete rebuilding. On thorough examination of the *Wasp*, previous to careening, only one unsound timber was found in her.

A summary of the work at the Washington navy yard in 1811 and 1812 includes detailed overhaul given twenty-one ships and frigates; and internal improvements made in the yard include improvements in the steam engine and sawmill departments, additional storehouses, repairing and erecting master sheers, and the usual transportation to other ports of provisions, armaments, etc.

The records inform us that on August 6, 1812, Mr. John Eliason, of Georgetown, sold to the yard for Navy use, 120 barrels of "good whiskey" at fifty-two cents per gallon. In the absence of other provisions, the practice had grown among the civilian mechanics and laborers of the yard of sending out, daily, men or boys to bring in liquor for their use. The commandant objected to this practice on the grounds that such errands necessitated the frequent breaking off from work on the part of those engaged, for an hour or more, thus resulting in the loss of time and labor owed to the government. The blacksmiths of the yard sent in a formal complaint to the Secretary of the Navy that they were not allowed "refreshments" while engaged in heavy work. But the commandant managed to hold firmly to his purpose and at the same time allow the desired refreshment, as indicated in the following note: "If such indulgence is necessary, the liquor may be brought into the yard at bellringing."

The practice of duelling still prevailed at this time. Among the records, we find a letter to the Secretary of the Navy, indorsed by the commandant, from Midshipman Lynch, who was slowly recovering from a severe wound received in a duel. The letter is a request that full pay be allowed him during his disability and that he be placed in such service as in his present state he may be able to perform. The commandant in his letter of indorsement says, "I do not think that Midshipman Lynch was to blame in the affair."

The prophets of peace and champions of economy in the War Congress of 1813-14, held that the British men-of-war crowded with trained sailors and soldiers, would be content with the complete control of the Chesapeake Bay, and questioned their leaving the rich tobacco fields and hen roosts to venture so far inland merely to take possession of the capitol and play "Hun and havoc for a few hours."

A portion of the British forces debarked from their ships on the Patuxtent River and moved slowly on Washington. They met with no serious systematic resistance, except that made by Commodore Barney, commanding sailors and marines from the small gunboats or galleys, which were burned and abandoned as the British advanced. The main objective was the destruction of public buildings, especially the navy yard, and shipping.

Captain Tingey, by order of the Secretary of the Navy, as soon as he was officially informed of the retreat of our Army, applied matches to the buildings and shipping in the navy yard, almost simultaneously with those applied to other public buildings

in the city by the British. The few buildings which were not burned were set afire by the enemy forces when they reached the navy yard. Captain Tingey left in a boat and remained at Alexandria. The British admiral had ordered that the officers' quarters should not be destroyed, but upon the return of the commandant two days later he found that the people in the neighborhood had pillaged the living quarters, even to fixtures and door locks. In three detailed reports he told of the loss incurred to public property, which totaled $417,745.

In the following months Robert Fulton, already distinguished as the author of a new and successful discovery, appeared for a second time with an ingenious invention, with which he proposed to attack vessels of the enemy below the surface of the water. The navy yard was ordered to do all in its power to facilitate his torpedo inventions. Commodore Rodgers opposed this invention as impracticable; the use of such destructive and unchivalrous weapons was probably regarded as in violation of the laws of civilized war. It appears that Fulton did not in the end receive sufficient encouragement to enable him to perfect his design.

In February 1818, the Secretary reported to Congress as follows:

> One line-of-battle ship is now building from promiscuous timber collected at this Navy Yard. There is also promiscuous live oak collected at this yard for framing a frigate. The commissioners have also established an anchor shop, where all anchors required will be made. They are also now making iron cables at this yard. The ship ordered to be laid down at Washington has been put on the stocks and is now progressing.

In December of the same year Commander John Rodgers, president of the Board of Navy Commissioners, reported:

> An anchor shop has been established at this yard where all the anchors of the ships authorized by the Act for the gradual increase of the Navy will be made. They have attached to the steam engine at this yard the machinery for making blocks, which will enable them to supply the demand at much cheaper rate than by purchase, and also secure uniformity in the construction of blocks, which is essential. A factory for chain cables is also established at this yard.

Congress in 1824 passed a bill arranging the navy yard into classes, and the Washington navy yard was named in the first class.

Captain Tingey, having served as commandant under six presidents, made a request on February 2, 1829, as follows:

> Knowing that you have not been unmindful of the duties of my situation, being the only officer in the service charged with the twofold duties of commanding an important station and that of Navy agency also, I have hoped to have a release from the additional duty of the agency, but have remained silent on the subject, and probably would have continued to do so rather than trouble Congress, being ever willing to encounter any duties enjoined upon me that my strength and abilities may admit of; but justice to myself in my present infirm state, and approximating the close of my seventy-eighth year, I am incapable of the lively energy of a youthful seaman and require some relaxation at least from the multiplicity of cares these double duties require. I am, therefore, constrained to solicit your further endeavors to have me released from the duties of the agency altogether.

Another letter in reply to an inquiry whether the services of certain midshipmen were absolutely necessary at the Washington navy yard, was addressed to the Secretary as follows:

> I beg leave to state that I have never considered the service of a midshipman indispensable to the duties of this station. It is, however, convenient occasionally to have the services of one.

Captain Tingey, by personal application to the Secretary, secured the appointment of his grandson, Thomas Tingey Craven, as midshipman to the frigate *United States* in July, 1823, and in April, 1828, he requested in behalf of this youthful officer that he be permitted to appear before the board of examiners for promotion to a lieutenancy, although he had not yet completed his twentieth year of age.

The increasing shallowness of Eastern Branch of the Potomac caused the Washington navy yard to cease gradually to be a resort of ships needing repair, and the yards at New York and Norfolk almost entirely supplanted it in this work and also to a considerable degree in new construction.

The frigate *Columbia* was launched in March, 1836, "about twelve o'clock from the navy yard in this city, in beautiful style. She is pierced for sixty-four guns."

Captain Kennon was appointed commandant in 1841 and among his first official letters is found one asking that the number of midshipmen attached to the navy yard should be increased, as he thought that the navy yard would afford excellent opportunity for the study of steam navigation and "enginery," and that the public property would be much better guarded if there were officers enough in the yard to keep a regular watch day and night.

In response to this appeal, Lieutenant Wm. D. Porter and several midshipmen were ordered to duty in the yard. An accident occurred in the armory shop in which one of the workmen lost his life. The accident resulted from a premature explosion of a shell invented by Lieutenant Porter, caused by an attempt to screw in the plug after the explosive matter had been put in it. It appeared that these experiments were conducted by Lieutenant Porter without due authority or permission, and upon investigation his actions in the matter were represented as insubordinate and evincing a criminal carelessness in handling dangerous explosives. The commandant did not see fit at this time to take any action upon the report, and later when Lieutenant Porter became acting executive officer of the yard, an article appeared in public, under the signature of this officer, severely criticizing certain persons in Washington. The commandant ordered Lieutenant Porter suspended from duty and tried by court-martial. Porter was sentenced to be publicly reprimanded. Later another explosion occurred and the commandant ordered the guard at the yard not to allow Porter to enter. The Department was requested to confirm this order, but declined.

Captain Kennon had been appointed a member of a court-martial to convene at Philadelphia for the trial of a captain in the Navy. He replied to the letter of appointment as follows:

> It has not been my practice to shirk any duty or responsibility imposed upon me by the Department, but I have to request that this order be countermanded. The captain to be tried by court-martial is my friend. We were midshipmen and lieutenants together, and have always been intimate friends. It will be painful in the extremest degree for me to sit as a member of a court on his trial. Besides, I have conversed with him in regard to the case and thus have become possessed of circumstances that have so fixedly biased my mind that possibly it might not be in the power of testimony to alter.

The order was countermanded and the captain was relieved from this painful duty.

The yard continued as a source of supply for vessels, and carried on a very inconspicuous routine for several years, having made various improvements in the anchor shops, forge shops, galvanizing apparatus and the laboratory, which was actively employed in preparing fuses and other fireworks for the bureau of ordnance.

Among the events in 1844 mentioned in the records was the arrival of the U.S.S. *Colonel Harney* with statues from the Old World for the rotunda of the Capitol. Also, during the summer, Mr. Samuel Colt, of pistol fame, furnished with such facilities as could at the time be offered by the commandant, was engaged at the yard in making experiments with a submarine invention. He succeeded in blowing the bottom out of an old ship's hull, which sank in the bed of the river, obstructing the channel and causing the formation of an extensive sand bar, which was not removed until 1859.

The following is from the estimate of ordnance and ordnance stores and small arms required for the general service of the Navy for the year 1849:

> For making ordnance stores, and machinery for working up the same, including a boring mill and large turning and planing lathe, battle and magazine lanterns, cannon locks, cannon primes, percussion caps, and other articles of ordnance stores, for a gun and musket pendulum at the navy yard, Washington, $70,000.

The Secretary of the Navy in an official report stated:

> This navy yard carries on a highly important manufactory of ordnance and ordnance stores, of anchors, chain cables, steam engines, and other fabrics of iron, and a building is now in progress in which to erect machinery for rolling copper, an establishment long wanted, as well on the score of economy as to furnish a better quality of rolled copper for sheathing vessels than can be obtained in the market.

In a report in 1855 the Secretary of the Navy refers to the bureau of ordnance as follows:

> The experimental establishment at the Washington yard has been for many years an admirable adjunct to the bureau. Having at its head an officer of high order and indefatigable energy, aided by a small corps of assistants, the Department has found it a shield of protection against the introduction of the novelties of visionary inventors. The officer referred to is Lieutenant Dahlgren, who with indefatigable efforts to give accuracy and greater effectiveness to gunnery and to improve the ordnance of the Navy has succeeded well, and none can doubt the advantage the service will receive therefrom.

The Secretary also highly praised the building and repairing machinery at the Washington navy yard, where the boiler and entire machinery for the *Minnesota* were built.

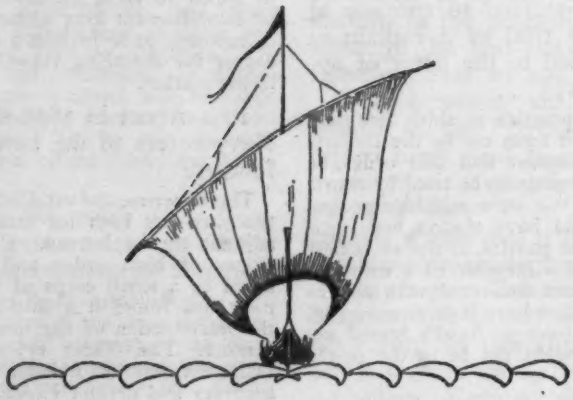
"Mr. Jefferson Davis, Acting Secretary of the Navy, directed the commandant on

October 11, 1853, to receive a captain of the Imperial Russian Navy, a representative of the Russian government, whose mission was to examine all that related to the progress of naval construction in the Navy and merchant service, and afford him every facility for inspecting all parts of the navy yard and its improvements. This Russian representative doubtless heartily availed himself of the *carte-blanche* so generously extended him. It appears that he carried away designs of the improved cannon invented by Dahlgren, who, in his memoirs, stated that some of his improved designs for guns and carriage were used on Russian frigates without any compensation to the inventor and without his permission.

The Secretary of the Navy ordered Commander Dahlgren, lately promoted to this rank, in December, 1855, to the command of a vessel to be devoted exclusively to gunnery practice, with a view to training both officers and men in a duty which constitutes the real justification of a man-of-war.

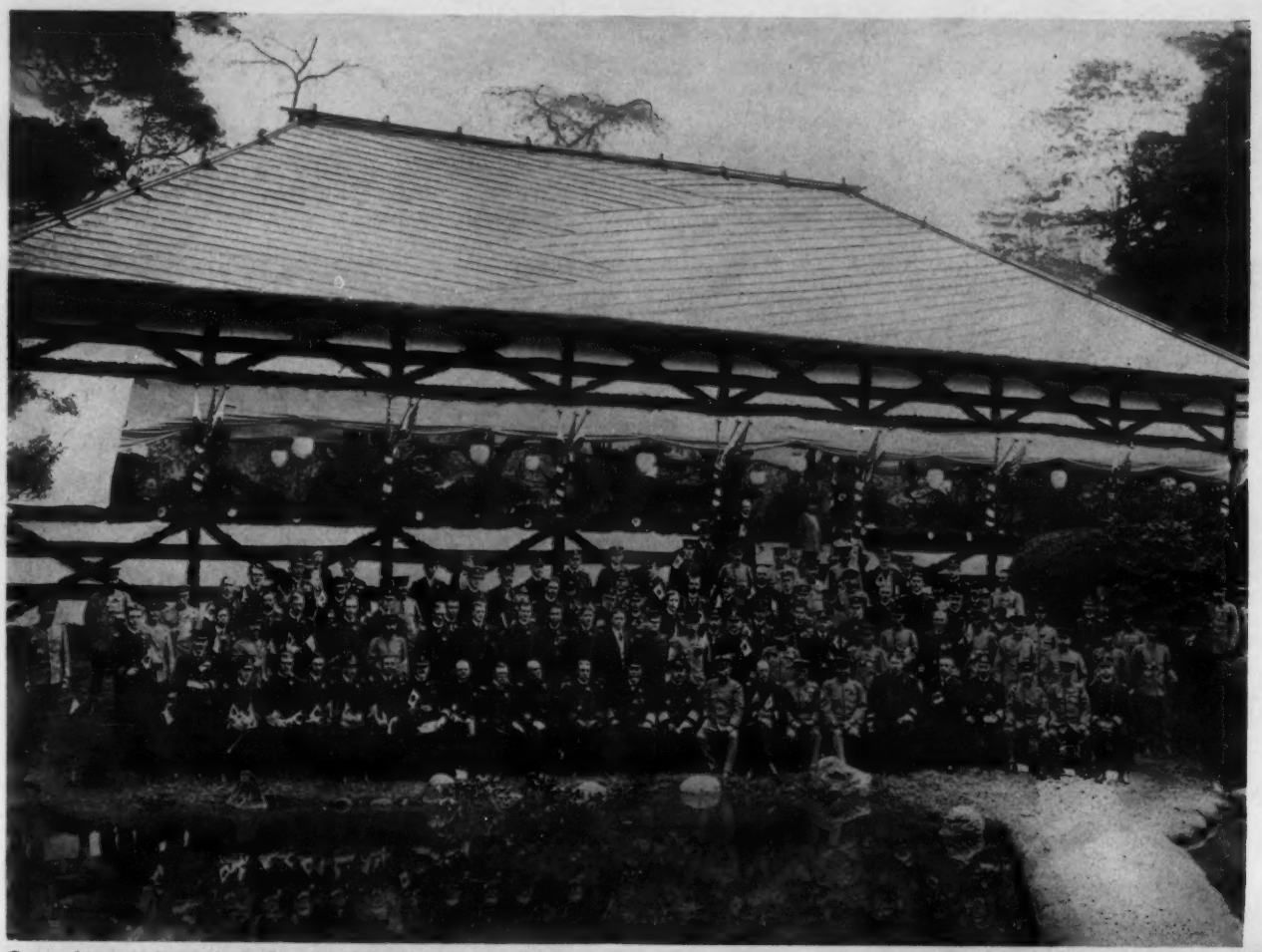
The *Plymouth* was ordered repaired and prepared for sea for these experiments, and in June, 1857, the ship, armed and equipped under the immediate direction of Commander Dahlgren, was towed down the river and made a successful cruise of several months, during which the heavy 9-inch and 11-inch Dahlgren guns constituting her armament were proved to be as manageable in heavy seas and as effective as ordnance of less weight.

During the Civil War, the Washington navy yard served as a repair and outfitting station for equipment of every description, and continued these activities until 1886, when by order of the Secretary of the Navy, it became an ordnance factory exclusively.



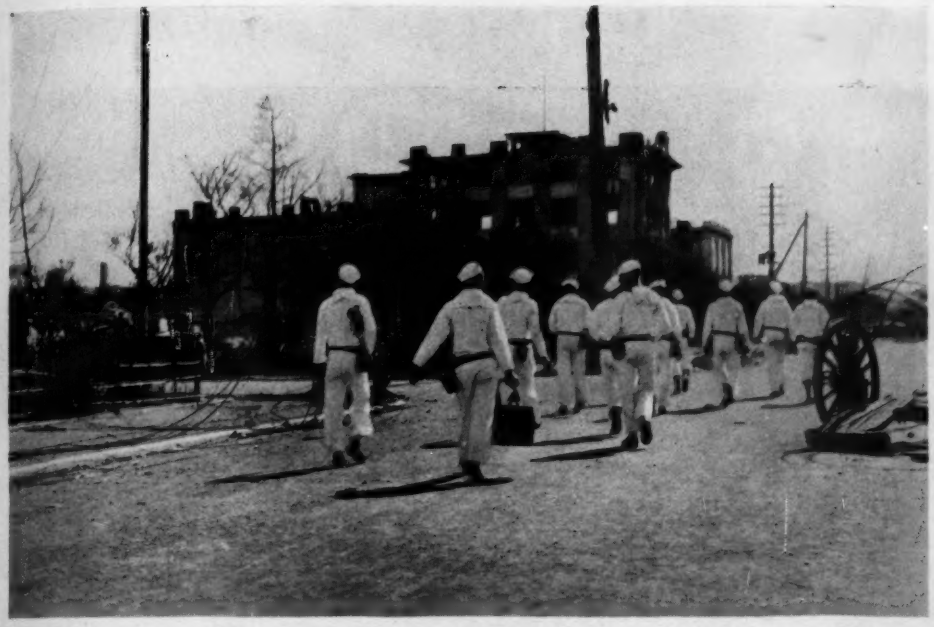
Courtesy Bureau of Ordnance, Navy Department

WATERFRONT VIEW OF THE WASHINGTON NAVY YARD AND NAVAL GUN FACTORY
The President's yacht, the *Mayflower*, is seen at the base of the radio towers.



Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

UNITED STATES AND JAPANESE OFFICERS, TOKYO, 1908
This picture was taken at a garden party given to the officers of the U.S. fleet, in Tokyo, Japan.



Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)
UNITED STATES AND JAPANESE OFFICERS, TOKYO, 1918
This picture was taken at a garden party given to the officers of the U.S. fleet, in Tokyo, Japan.

Courtesy Navy Recruiting Bureau, New York

OUR NAVY ON THE JOB

Following the great earthquake in Japan the first effective aid from the outside world was rendered by the United States Navy in characteristic fashion. These pictures show some of the relief work of our bluejackets in Yokohama. As soon as the emergency had passed, Admiral Anderson, commanding the U.S. Asiatic Fleet, tactfully withdrew all of his ships from Japanese waters.

Courtesy Navy Recruiting Bureau, New York

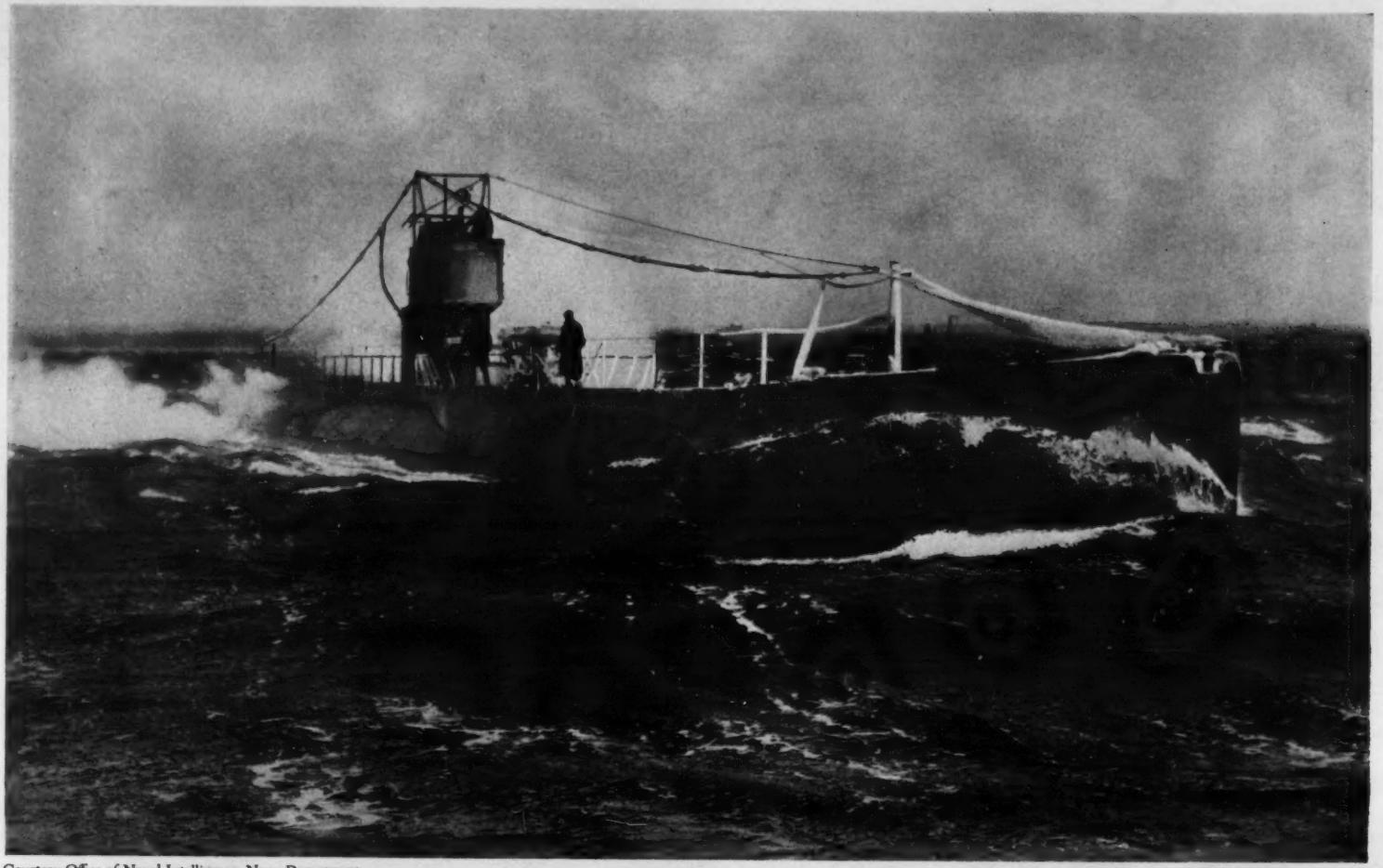
LET A SMILE BE YOUR UMBRELLA
Japanese and American bluejackets fraternizing.

Courtesy Navy Recruiting Bureau, New York

LET A SMILE BE YOUR UMBRELLA
Japanese and American bluejackets fraternizing.

Courtesy Office of Naval Intelligence, Navy Department

"SPEED, DASH AND ACCURACY"
Destroyers befog the issue.



Courtesy Office of Naval Intelligence, Navy Department

WHERE SEAGOING IS *NOT* FOR PLEASURE

Submarine taking a cruise in freezing temperatures. Note the ice on the rigging.

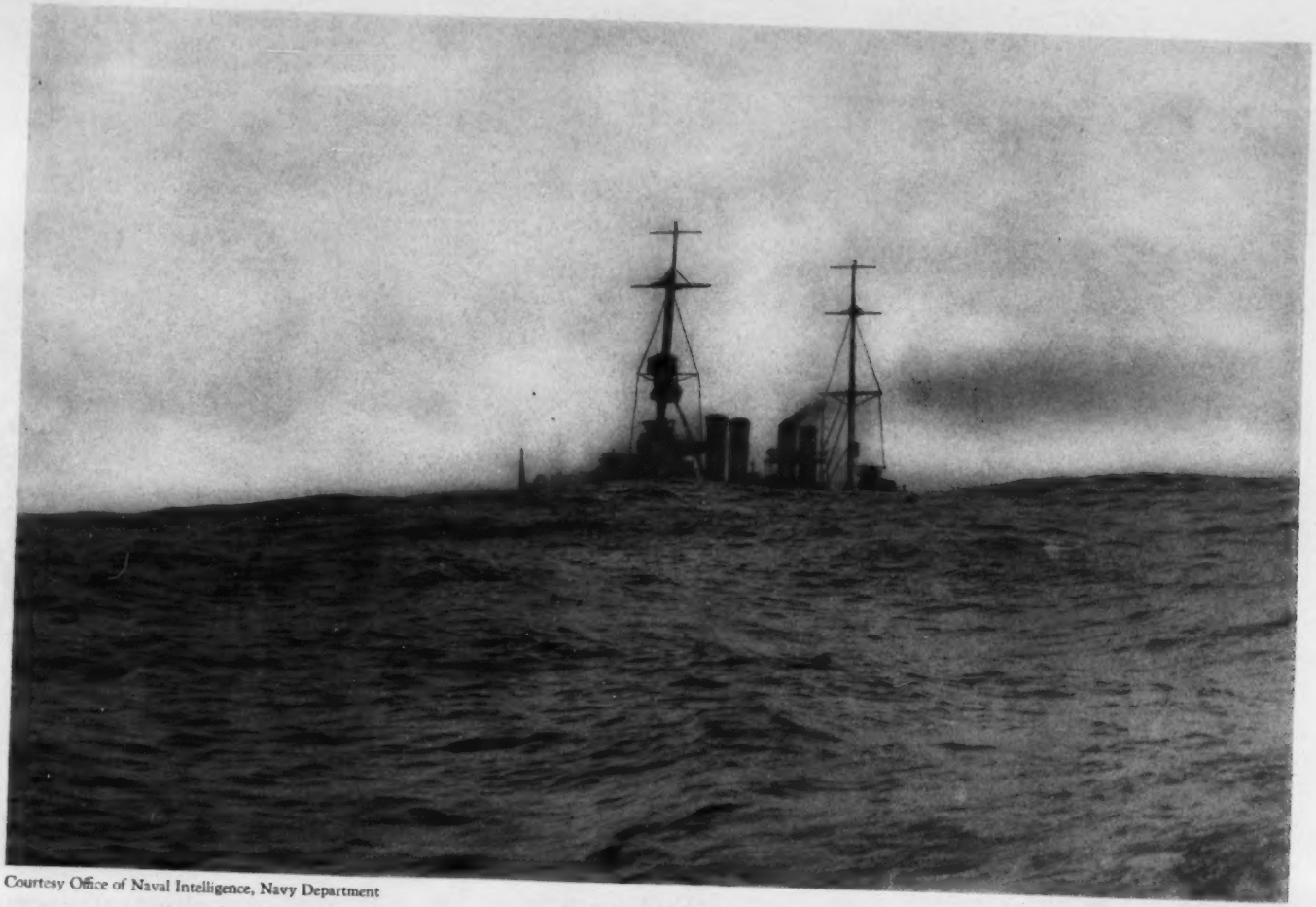
WHERE SEAGOING IS *NOT* FOR PLEASURE

Submarine taking a cruise in freezing temperatures. Note the ice on the rigging.

Courtesy Bureau of Construction and Repair, Navy Department

U.S.S. *TRENTON*

One of our ten 7,500-ton cruisers. Until we build others these ten represent the only cruisers we have with a sufficient speed to keep clear of modern battleships.



Courtesy Office of Naval Intelligence, Navy Department

U.S.S. *MARBLEHEAD*
In heavy swells, on her trip to troubled China, 1927.

The Problem *of the* Naval Design Engineer *as* Affected *by the* Limitation *of* Armament Treaty

By CAPTAIN O. L. COX, *U. S. Navy*
and COMMANDER C. A. JONES, *U. S. Navy*

IMPORTANT provisions of the treaty limiting naval armament which affect the problems of the naval design engineer are:

Article IV limits the total capital ship replacement tonnage of the United States to 525,000 tons standard displacement.

Article V states that no capital ship exceeding 35,000 tons standard displacement shall be acquired by, or constructed by, for, or within the jurisdiction of any of the contracting powers.

Article VII limits the total tonnage of aircraft carriers of the United States to 135,000 tons.

Article IX states that no aircraft carrier exceeding 27,000 tons standard displacement shall be acquired by, or constructed by, for, or within the jurisdiction of any of the contracting powers. However, any of the contracting powers may, provided that its total tonnage allowance of aircraft carriers is not thereby exceeded, build not more than two aircraft carriers, each of not more than 33,000 tons standard displacement, and in order to effect economy, any of the contracting powers may use for this purpose any two of their ships, whether constructed or in course of construction, which would otherwise be scrapped.

Article XI states that no vessel of war exceeding 10,000 tons standard displacement, other than a capital ship or aircraft carrier, shall be acquired by, or constructed by, for, or within the jurisdiction of, any of the contracting powers.

For the purpose of clarifying the treaty, certain definitions are given in Part 4 as follows:

A capital ship, in the case of ships hereafter built, is defined as a vessel of war, not an aircraft carrier, whose displacement exceeds 10,000 tons standard displacement, or which carries a gun of a caliber exceeding eight inches.

An aircraft carrier is defined as a vessel of war with a displacement in excess of 10,000 tons standard displacement designed for the specific and exclusive purpose of carrying aircraft.

The standard displacement of a ship is the displacement of a ship built, fully manned, engined, and equipped ready for sea, including all armament and ammunition, equipment, outfit, provisions and fresh water for a crew, miscellaneous stores and implements of every description that are intended to be carried in war, but without fuel or reserve feed on board.

The word "ton" in the present treaty shall be understood to mean the ton of 2,240 pounds.

Before the adoption of this treaty, the general procedure was for the General Board of the Navy to determine the number and type of the various vessels of war necessary to add to the fleet to make it effective for national security. They laid down the general requirements of armor, armament and speed necessary to produce the most efficient fighting unit of the type under consideration. The general characteristics of armor, armament and speed were then referred to the various material bureaus for calculation of tonnage, power and details of dimensions. The only cognizance the General Board took of tonnage, power and details of dimensions was as they affected the fighting characteristics, maneuverability or ability to navigate waters which it might be necessary for them to use.

The treaty limiting naval armament prac-

U.S.S. *MARBLEHEAD*
In heavy swells, on her trip to troubled China, 1927.

tically reverses the above procedure. It will be noted from its provisions that capital ship tonnage is limited to 35,000 tons and aircraft carriers to 27,000 tons. It might be assumed that this in effect means that all future capital ships will be of 35,000 tons and all future aircraft carriers will be of 27,000 tons. This is not necessarily a true assumption in the case of aircraft carriers but is true for capital ships. Part 3 of section 2 specifies the years, beginning in 1931, when replacement capital ships may be laid down and the years in which existing vessels are to be scrapped. This table not only limits the total tonnage to 525,000 but also limits the ultimate number of capital ships to fifteen. This is where the naval design engineer comes in. His problem is, having due regard to reliability, ability of the machinery to withstand shock—both as a result of its own gunfire and the shells of the enemy—and alternate methods of operation in case of casualty or damage, to obtain the maximum speed and the maximum cruising radius on the minimum weight.

For the aircraft carriers there remains an allowed tonnage of 69,000, the *Lexington* and *Saratoga* having been completed at 33,000 tons each as allowed by the treaty. Assuming that the most efficient tonnage lies between the 10,000 and the 27,000 tons standard displacement, the problem of the designer is to capitalize weight to a greater extent than ever before in order to produce as many units as possible of the maximum efficiency from the allowed 69,000 tons standard displacement. The greater the weight saving made by the designer, assuming equal speed and economy of operation, the less the tonnage for equal offensive and defensive powers, and thus the larger number of units which can be built.

The fact that the treaty placed no limit on the number of surface craft of 10,000 tons standard displacement and below, has given rise to an entirely new type of light, fast cruisers carrying guns not in excess of eight inches caliber. This has introduced a new meaning into the phrase of "competitive building." Where formerly this meant competition in numbers and efficiency irrespective of tonnage, it now means competition in numbers and efficiency on a given definite displacement. The naval design engineer should welcome this change as it reduces the design problem to a more scientific basis. Every ton of weight saved means added offensive or defensive power represented in additional armor, armament or equipement. Also on a given weight every gain in economy represents a gain in cruising radius, thus increasing the strategical points of superiority.

The number and tonnage of surface craft of 10,000 tons and below, standard displacement, such as destroyer leaders, destroyers, gunboats, and small scout cruisers, and also the number and tonnage of submarines, are not limited by the treaty; therefore it has no direct bearing on the design of these types. However, the information and knowledge gained in designing lighter and more efficient machinery for other types can and is made use of in these types, resulting in material improvement.

The matter of weight has now assumed such importance that all ship contracts made since the signing of the treaty carry a heavy penalty for overweight. In awarding the contract for machinery and material, the bidders now compete on design as well as on a price basis, as the bids are evaluated on a weight basis giving a direct monetary value to savings in weight.

In order to show what this competition in weight and economy is accomplishing, a few examples of improvements are given.

Turbo-electric generating sets have been reduced in weight from seventy-eight pounds per kilowatt output to forty-eight pounds. At the same time economy has been improved from twenty-four pounds to 16.7 pounds of steam per kilowatt output at rated load.

Forced draft blowers have been reduced in weight from 163 pounds to fifty-three pounds per 1,000 cubic feet of air per minute, while their economy has been improved from 2.9 pounds to .71 pounds per 1,000 cubic feet of air delivered per minute.

It was seen in the first design of the limited-tonnage ships that the mast weight must be cut materially. This immediately produced a surge in the development of searchlights, which, being mounted far up on the masts, affect the ship's stability. Here aluminum was resorted to, and many castings were changed to thin ribbed sheet. The resulting "lightweight" searchlights save about ten tons per ship in themselves, besides enabling considerable reduction in the size of the mainmast. Incidentally, this

weight-saving development was accompanied by radical improvements in the lamp characteristics, and in the design of both the signalling and iris shutters.

The realization of what could be accomplished in lightening searchlights was the spur to further attempts to provide submarines with adequate signalling lights for daylight work. This problem has been solved and the service is being furnished a searchlight only thirty inches high and weighing less than eighty pounds which can signal successfully a distance of eight miles on a clear day.

Telephones are a very necessary means of communication on a modern warship, but upon investigation, the weight of the phone system in use at the time of the armament conference was found to be staggering.

The systems were investigated from all angles and the automatic exchange type eventually was adopted. As at present installed this apparently inconspicuous item saves over eleven tons per ship, mainly in wiring.

This matter of wiring continually demands further development. For example, the older direct current type of rudder indicator or engine order telegraph used a twenty-two conductor cable, sheathed in lead and galvanized steel braiding. By shifting to alternating current telegraphs of the synchronous type, and eliminating lead, the cable was reduced to five conductors, and, considering all the many telegraphs on a ship, the weight per ship was reduced by over seven tons.

Each item of machinery has been carefully considered and reductions in weight as well as increased economy have been effected wherever possible. Aluminum and its alloys have been of special value in making reductions possible. Before aluminum could be used, extensive experimental work had to be carried out in order to determine the physical characteristics of various aluminum alloys, and also, most important, the effects of salt and boiler compound on its physical characteristics. In spite of careful investigations before adoption, difficulty was experienced in the use of aluminum due to seizing of threaded parts and corrosion of aluminum in contact with copper and copper alloys.

The changes in the engineering plants which took place between the building of the battleships which cruised around the world in 1908 and the dreadnaughts of the *West Virginia* class involved a gradual growth, each succeeding type being based largely on previous design and experience. While major changes such as the shift from reciprocating engines to turbines, and from direct or geared drive to electric drive, and from coal to oil, were made from time to time, there was always a certain similarity to previous types by which designers could be guided. When the battle cruisers, now known as the aircraft carriers *Lexington* and *Saratoga*, were contemplated, the increases in horse-power, displacement and speed were of such magnitude that previous experience was of little value and the designers had to strike out into untried territory. (See Table I.) Considerable controversy, therefore, arose, and many pessimistic prophecies were made concerning them.

The bureau of engineering was assailed by critics who declared in no uncertain terms that the propellers were "all wrong," and predicted that the vessels would never make their designed speed.

It is, therefore, with considerable pride and satisfaction that the results of the recent trials of these vessels have been made public. Because of unforeseen difficulty in part of the turbine blading, the maximum power

TABLE I.

	Nebraska 1904	*Delaware* 1909	*West Virginia* 1921	*Lexington* 1928
*Displacement	14,030	18,900	31,200	33,000
Length	435′	510′	600′	850′
Beam	76½′	85¼′	97¼′	106′
Draft	26′	27′	30½′	27.9′
Designed I.H.P.	21,000	25,000 (SHP)	28,900 (SHP)	180,000 (SHP)
Speed	19.	21.	21.	34.

*Exclusive of fuel and reserve feed.

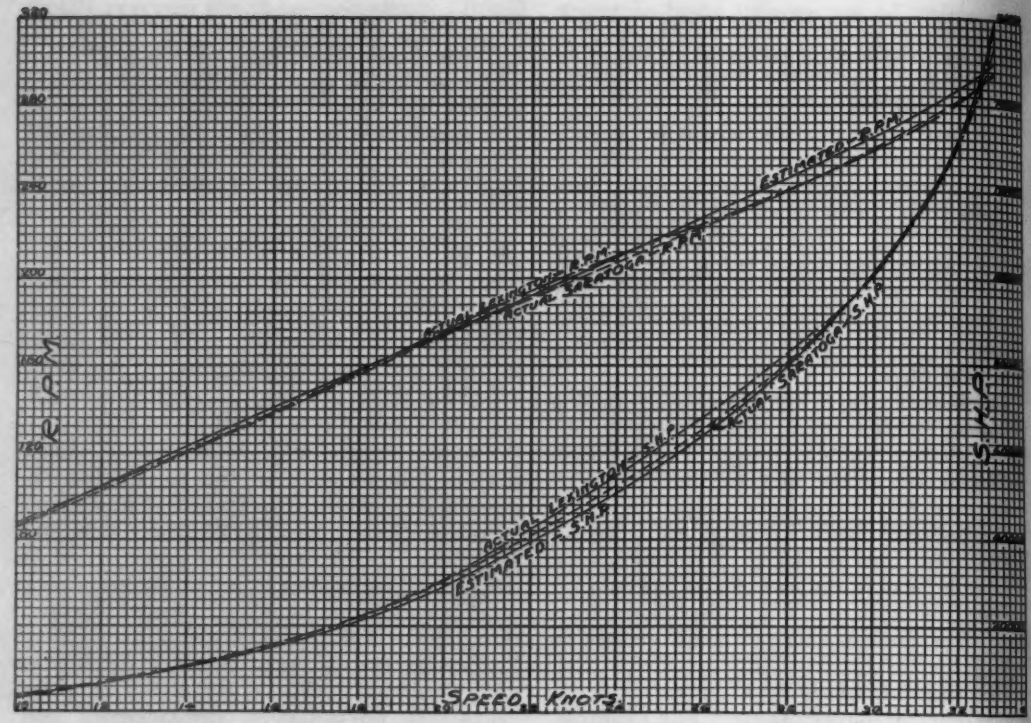


Fig. I. U.S.S. *Lexington* and *Saratoga*—Actual and Estimated Performance.

will not be developed until these weak sections are rectified, but as ninety-seven per cent of the designed speed has been attained on eighty-five per cent of the designed power, there is no element of doubt as to the correctness of the bureau's design and estimate.

Table II and Figure 1 show the comparison of the estimated results with the actual on the two vessels. The propellers were designed and the estimate made in February, 1923; the trials of the vessels were run in 1928. It will be noted that the agreement is excellent, and where differences occur in one vessel they are corrected in the other, indicating that the observer and instrument errors are well within the allowed error of estimating.

TABLE II.

	S. H. P.			R. P. M.		
Speed	*Estimate*	*Lexington*	*Saratoga*	*Estimate*	*Lexington*	*Saratoga*
10	3,620	4 000	3,500	86.0	87.0	85.4
16	15,000	15.250	15,750	140.0	138.8	138.0
20	29,500	31,300	30.600	175.0	175.2	173.3
24	51,000	54,400	52,500	211.0	210.2	207.7
28	81,000	83 500	81,200	247.0	241.9	240.0
30	102.000	101,000	101,500	265.0	259.1	259.5
32	132.500	130,000	132,500	288.0	281.6	282.5
33	159,500	153 600	158,375	301.0	297.0	295.6

What *the* Naval Building Program Means *to* Design

By COMMANDER HERBERT S. HOWARD *(CC), U. S. Navy*

THE old saying is that the proof of the pudding is in the eating. Anybody can prepare a delicious-sounding recipe but unless a pudding is made and eaten we will never know whether the recipe is good.

The same holds equally true in the design and building of naval ships. Designs of ships can be made which promise great results in speed, gun power, and protection, but unless ships are built from these designs we will never know whether the high promises have been or can be fulfilled. Skill in ship design and shipbuilding is based practically on experience. The longer new building is delayed the more will be the deterioration in both the designer's skill in making the plans and in the shipbuilder's skill in executing these plans.

Since the Limitation of Armament Treaty in 1922, we have laid down eight cruisers and three submarines; none of the light cruisers have been completed, i.e., put to the proof. Two battle cruisers have been converted to airplane carriers. Thus there has been practically a stoppage of naval construction. Shipyards have been closed and the work at navy yards has been greatly reduced. With the closing of some shipyards and the slackening of work at others, the skilled men, trained through years of experience to the high standards required of naval construction, have been scattered into other lines of work, and the patiently gained knowledge and skill of these men is now largely lost to shipbuilding and thus to the Navy. To illustrate this scattering of skilled shipbuilders to other lines of work, it was necessary for three different contractors for the last six cruisers ordered to establish a central drafting office at Philadelphia, as there were not enough trained draftsmen available to permit each shipyard to build up its force to the required extent.

The bureau of construction and repair is that branch of the Navy Department charged with the design of naval vessels, and quite aside from the question of the needs of the Navy for new ships of the various types and classes, this bureau is particularly interested that a new building program be approved by Congress, in order that skill in the design and building of naval vessels shall not be lost. Even if skill in designing could be maintained by preparing designs only, the interest of the designers will surely lag, unless they see the product of their skill made to live in completed ships, and with the lagging of interest, skill and ability will most surely suffer and eventually disappear. This skill once lost cannot be re-created in time of sudden emergency, when with a war at hand, we are called upon to build ships and ships and still more ships.

The Secretary of the Navy this past year submitted to Congress a building program of naval ships in carefully determined numbers, to round out the fleet into a well-balanced whole, and to replace ships which have already passed or will shortly pass the age limit of their usefulness. This building program failed of passage in the closing hours of the Congressional session.

The program recommended included four different types of naval vessels: cruisers, airplane carriers, destroyer leaders, and submarines. Each type presents its own problems from the point of view of the designer, and each type is one which we will be called upon to build in numbers in the event of war.

Since the end of the war, great advances have been made in the materials of engineering and in engineering practices.

Even to the layman these advances are brought home in the development of electric and gas welding, which he now sees used in the construction of the iron work on bridges and buildings instead of the long-established riveting; the coming of the use of aluminum and aluminum products to save weight in the building of large airships; the widespread use of small, light refrigerating machinery; and in many other ways. Every one of these developments has its application in naval shipbuilding, but unless ships are built, determination as to their possible application and value will rest only on theory and not on actual practice.

In addition to these general features of engineering development, the cruiser presents a number of particular problems, especially from the point of view of restrictions existing nowadays which were not experienced in past years.

The Limitation of Naval Armament Treaty placed a limit upon the maximum displacement of cruisers of 10,000 tons, and a limit upon the size of the guns of 8-inch caliber. Smaller cruisers, of course, may be built, but the needs of the United States Navy will best be met by cruisers of the largest size permitted by the treaty. The problem of the designer is therefore to give the best possible ship which can be built on a displacement of 10,000 tons. He must bring into play every element of the modern developments in engineering skill and practice, to reduce to the minimum the weight of all features of the design which do not enter directly into the military characteristics of the ship. This must, moreover, be done without sacrificing structural strength.

Here enter those elements of the engineering developments of the past years. If welding can be used to connect the structural parts of the hull, the weight of straps and rivets will be saved. However, welding has not reached quite the point where full reliance can be placed upon it for the main girders of the ship. It can, however, be used very generally where local strength only is needed, and thereby much weight is saved and made available for guns, armor, and machinery. With the ship built and in service, the welding used may prove itself so reliable that in the next ship to be built, welding throughout can be adopted with further savings made available for the essentials. Only time and the building of ships will tell.

Similarly, there can be used in many places, such as bulkheads for staterooms, and storerooms, the aluminum alloys developed by the airship builders, duralumin and allied materials, and weight thereby saved for the essentials.

In the machinery plant itself, there is opportunity to take advantage of the improvements in steam machinery during these past years, particularly in the use of higher pressure steam with increased power for the same weight. Thereby the speed of the ship will be increased.

In many other fields, new apparatus is available for these new ships; steering gear and windlasses of improved type, automatic steering apparatus which will ensure steady courses in formation and in battle, modern refrigerating apparatus of greater efficiency and less weight. The list might be multiplied indefinitely.

For the second type of ship, the airplane carrier, it is almost unnecessary to enumerate the reasons why the building of such a ship is of great importance from the particular point of view of the designer as well as from that of the Navy in general.

We have three airplane carriers in service, it is true, the *Langley*, the *Lexington*, and the *Saratoga*. However, the *Langley* is a converted collier, and has, since her conversion, been looked upon purely as an experimental vessel, on board of which the problems of airplanes taking off from and landing upon a flying deck could be thoroughly studied. Her low speed, if no other reason, prevents her use as an active fleet unit. This leaves the Navy with but two carriers, the *Lexington* and *Saratoga*. It does not take an expert, in these days of the rapid development of aircraft, to demonstrate that the Navy must have more than two carriers to fill its needs.

Moreover, speaking from the point of view of the designer, the *Lexington* and *Saratoga* were not in any sense designed as aircraft carriers from the ground up. These ships were originally building as battle cruisers, and by the Washington treaty we were permitted to convert them to large airplane carriers instead of scrapping them. Thus, they represent the best design of airplane carrier—based on the limited experi-

ence with the experimental ship *Langley*, that it was possible to produce from a partly completed ship originally designed as a totally different type of warship.

Thus we have no airplane carrier designed and built from the beginning to embody the best thought as to what such a ship should be. That such ships should be built appears self-evident in these days in which aviation has come to take so prominent and important a part in modern navies.

Airplane carriers are limited by the naval armament treaty both as to size of individual ships and as to the total tonnage which may be possessed by any of the nations concerned. For the United States the total tonnage of carriers allowed is 135,000 tons. The first question to be determined is, therefore, the size of the carrier needed. The Navy Department believes that the remainder of our allowance of aircraft tonnage should be utilized in building carriers of about half the size of the *Saratoga*.

With the size generally determined, all the matters of modern engineering practice referred to in the case of the cruisers come at once into the question, for in order to build the best aircraft carrier on the tonnage allowed, weights, essential and non-essential, must be saved so that the carrier may accommodate the greatest possible number of planes.

In addition, the airplane carrier presents from her very existence many problems not found on other types; the size and arrangement of a flying deck, the arresting gear for securely stopping and retaining planes which land on the deck, huge elevators for carrying planes between the hangars and the flying deck, and the disposal of smoke and gases from the boilers through smoke pipes which will not interfere with flying operations. All these problems require not only study and solution on paper, but actual working out in the building of a ship, in order to ensure that the solution arrived at will meet the needs of the service.

The third type of ship in the building program is the destroyer leader. The name "destroyer leader" many times causes a question to arise in the minds of both naval officers and laymen as to just what such a ship is and what she is intended for. A destroyer leader may be said to be simply an up-to-date destroyer with accommodations increased sufficiently to permit the officer commanding a squadron of destroyers to use the vessel as his flagship in leading the squadron. The principal reason for building destroyer leaders, or destroyers, actually rests in the fact that, in spite of their numbers, all destroyers now in the Navy are old and of obsolescent design.

In the late war the needs of the Navy centered in destroyers, to counter the submarine war, and to convoy transports and merchant vessels, and all effort was bent to the building of this type, of which, at the end of the war we possessed some 300.

That was ten years ago, and the designs of the vessels date from 1916, twelve years ago. Since then we have built no new destroyers, and the two great shipyards which for years specialized particularly in building destroyers, the Bath Iron Works at Bath, Maine, and William Cramp and Son, at Philadelphia, have been forced to go out of the shipbuilding business for lack of work.

Of all types of naval vessels, with the exception of the submarine, the destroyer is the most highly specialized in design and construction. Everything is cut to the limit, and engineering skill in design of hull and machinery must bring into play every trick of the trade. No less important is the skill of the builders, who must be trained by experience to build this class of ship.

In these ten years, with two destroyer building plants out of existence and no destroyers building in any of the others, organizations capable of building destroyers have almost ceased to exist in this country. If another ten-year holiday in destroyer building ensues, it is doubtful if this country will be able to design and build a destroyer which will compare at all favorably with the product of foreign countries which have kept up the practice.

The situation abroad is quite different. During our time of idleness Great Britain has built or is building eleven destroyers and leaders; France, forty-four; Italy, twenty-eight; and Japan, fifty-one.

Although at present we have 274 first-line destroyers, sixty-six of them reach the end of their effective life by 1934, and another 105 of them in 1935. It is an absolute necessity that we should prepare for the replacement of these vessels by building new destroyers from time to time in order to bring design and engineering skill up to

date and to retain in this country the ability to construct these vessels, so vital to the Navy.

Finally on the program come submarines. Since the war we have continued to build submarines in small numbers, developing new types at intervals, and this building has permitted the design of submarines to be kept up to date, particularly in special types.

However, the main strength of our fleet in submarines rests in a large number of vessels built during the last war. These vessels are rapidly approaching the end of their effective life of thirteen years. By 1933 seventy-five of our 122 submarines will have passed their effective age. Moreover, since their building, developments in design have advanced enormously. The design and construction of submarines is more highly specialized than that of any other type of naval vessel, and like the destroyers, if skill in these arts be lost, it will be long before it is regained.

Fortunately, as stated above, Congress has appropriated for a small number of submarines since the war, and by the building of these vessels it has been possible to keep alive skill in the design and building, which is so necessary. Had a similar program been followed with destroyers, our outlook for that class of ship would not be so dark.

These submarines which have been built have generally represented special types with which it was considered essential that we have experience. Generally speaking, they do not represent the type which the fleet will need in the greatest number to replace the submarines now nearing the end of their years of active service.

It is therefore of the greatest importance, from the point of view of the designer, that at least some submarines should be built of the type most needed by the fleet. In this way the latest developments in design and building of these specialized vessels will be embodied in their construction and the organizations necessary to this construction will be maintained.

The preceding gives, from the point of view of the designer, a general survey of the particular features of each of the four classes of ships included in the new shipbuilding program recommended by the Secretary of the Navy to Congress this last year; cruisers, airplane carriers, destroyer leaders and submarines. In the past years, no limit, except that imposed by the money made available in the appropriations for building, has been placed upon the size of naval ships. Now, however, in two of the classes at least, the Limitation of Naval Armament Treaty has placed limits on the size, which calls for the display of skill greater than that demanded before, in order that the most for the money and the displacement may be obtained in the finished ship.

Finally and always, in the product of the designer's and shipbuilder's skill the fighting branch of the Navy must place its reliance in time of battle, and this product can never be fully tested until the day of battle comes. With constant practice, skill and knowledge increase, but without this practice ability atrophies.

The program of new shipbuilding recommended by the Secretary of the Navy is one carefully prepared to meet the needs of the Navy to give it a well-rounded fleet and to replace old vessels. From the point of view of those charged with the preparation of the designs of these vessels and their building it is more that that; it is an absolute necessity to ensure that in design and construction, the naval vessels of the United States shall be at least the equals of those of foreign nations.

Training *in the* Navy

By Rear Admiral R. H. Leigh, *U. S. Navy*
Chief of the Bureau of Navigation

THAT the Navy is constantly taking thousands of untrained men and boys from civil life is so well known by the average person that he accepts it as a matter of fact. He knows that these men become a part of the Navy's working personnel taking the places of thousands of trained men who leave the service each year and return to civil pursuits. He also knows that, somehow, this tremendous absorption of new and untrained men into the naval establishment seems to make no break in the effective operation of naval ships.

Those who deal closely with the training of men for specialized work in civil life will know that somewhere and somehow a tremendous problem of training and education is involved in making these untrained thousands of men into intelligent and effective units of the Navy's personnel. A blue uniform may work a quick transformation in the bearing and appearance of the recruit, but it carries no magic that can transform the untried and unskilled boy into a skilled electrician, a competent engineman, or an aviation machinist's mate fit to condition planes in which men must risk their lives.

No single industry calls for so wide a variety of skilled service, and no industry is called upon each year to replace so large a percentage of its trained men. Each year we must recruit and train an average of nearly 20,000 men. They must not only be trained to perform the work of their naval trade, but must receive thorough training in seamanship. They must also be trained in military tactics, for naval personnel must be able to operate ashore in landing parties. Most of these recruits are under nineteen years of age, few of them have a trade in civil life and fewer still have ever been at sea on any kind of ship. They come to the Navy from every state of the Union, with little or no similar experience that helps them in learning their new tasks.

How can the Navy assimilate these untried thousands each year, and still keep up to the minute with the heavy operating schedule required to keep ships at the highest efficiency? You may be sure that it does not occur through accident, nor through any gratuitous transformation of untrained men into intelligent and effective human factors in the naval establishment. The answer to the problem is training—systematic training that begins on the first day a man enters the service and ends on the day he leaves it.

To understand fully the magnitude and complexity of the task, one must first have a clear understanding of the modern Navy itself, and of what it demands of those who make up the complements of modern ships of war. Every important step in the evolution of the dreadnought from the old Revolutionary "ship of the line," which was its ancestor, has meant a corresponding step in the training of naval personnel. Every ingenious invention that has made the ship a more formidable weapon has meant that men must be developed with the necessary skill to operate and care for it.

Highly developed and specialized equipment calls for a corresponding specialization of the men who operate it. At present 149 ratings are needed to include men able to perform all the duties required of our enlisted force. The engines and boilers of the ship, the dynamos and other electrical equipment, the fire control and vast amount of ordnance equipment, the airplanes and their engines, all must be in charge of men trained for that responsibility. They must be men who are trained, not for general duty, nor for many duties, but thoroughly trained for one particular task involving a high degree of responsibility and skill.

From the recruiting offices throughout the country the new recruits are sent to the four great training stations, located at Hampton Roads, Va., Newport, R. I.,

Great Lakes, Ill., and San Diego, Calif. There they live for the first three weeks at the "receiving unit" of the training station, where they receive their first outfit of naval clothing, bedding, etc. During this first three weeks the training of the new men is begun, but they are quartered in small groups, inoculated against typhoid fever, vaccinated against smallpox, and kept under close medical observation, to guard against spreading contagious diseases that might be brought in from civil life.

When the recruit goes from the receiving unit to the main barracks of the training station he becomes a member of a well organized military company. In addition to military training he receives instruction in swimming and in the handling of small boats. He gets an elementary idea of seamanship and nomenclature of parts of the ship. He learns something of the ordinary routine on board which will save him some of the helplessness that a landsman often feels at the beginning of his first cruise. But most important of all, he learns to respond quickly and intelligently to orders and to lay the foundation for that neat orderliness which characterizes the average man-of-war's-man, no matter what his previous training may have been.

One of the most noticeable results of training at our naval training stations is the decided improvement in the physical condition of the average recruit. This is due partly to the proper medical and dental treatment given to those in need of it. It is due also to the regular hours required, to the drills, to the setting-up exercises, and the substantial, well-cooked food, served under sanitary conditions and at regular hours. The weight of each recruit is recorded when he reaches the station and again when he is sent to sea. It is not unusual for a man to gain fifteen or twenty pounds in weight during his first eight weeks at the training station, and records show that the average gain for all recruits during this period is more than six pounds.

A majority of the recruits leave the training station at the end of eight weeks to continue their training aboard the ships to which they are assigned, but a large number of them are selected for vocational training in the trade schools maintained at these same stations. In selecting men for this additional training, their own preference, their previous education, and vocational experience are considered.

The underlying principles of the trades taught in the Navy schools are identical with those taught by civilian schools. The naval electrician, radioman or engineer must know the same fundamental facts about electricity, radio, or steam, as thoroughly as men following similar trades in civil life. Much of the practical work of these trades that is taught in the Navy trade schools is identical with the practical instruction in any civilian trade school. But in the Navy every effort is made to familiarize the man with the same types of equipment and the same types of jobs that he will find on board ship. In every trade school the equipment used for the instruction of the men in any particular trade is the standard equipment of the Navy ships in service.

At the radio schools, for example, men are drilled in operation until they can "send" and "receive" at the rate of twenty words per minute. They also study the underlying principles of radio, and learn the upkeep and repair of the type of equipment they will find on ships and at radio stations. The course for machinist's mates covers much the same ground as courses for machinists in civil life. In addition, however, every machinist who graduates from the machinist's-mate school has a fundamental operating knowledge of marine engineering. He has learned how to operate steam engines, how to locate and repair their faults, and he is familiar with the regulations governing the care and upkeep of the types of machinery that he will find on board ship.

The kind and number of service schools maintained at any time depends upon the needs of the service. About two thousand men are kept under this intensive type of instruction, and at the present time the schools maintained are training men for more than twenty different naval trades.

But the major part of all naval training must always be done at sea. Training activities ashore can never relieve the need for systematic, conscientious training of all men throughout their period of active service. The Navy believes that permitting men to learn the duties of their ratings through experience alone is a slow and wasteful process. It will not supply the number of

highly trained men needed to replace losses and it does not make the most of the short period of service that most men render in the Navy. When experience at sea is supplemented by thorough, painstaking instruction, the time required to make men proficient in the work of their ratings is greatly reduced and the period of useful service they will render during their enlistment is correspondingly increased.

This continuous instruction is possible because our Navy has always placed its main dependence for training in a corps of highly trained and educated officers, capable of giving the best type of instruction to the men of their commands. Even at the most isolated naval stations or on ships that patrol the rivers of China, it is possible for every enlisted man to be kept under instruction and possible for him to earn promotion as he merits it.

Until recent years, the lack of suitable textbooks and other instruction material that exactly meets the needs of men in many of the naval trades has been a serious problem. Officers were forced in many cases to lay out their own course of instruction and instruct men largely by the lecture method. The bureau of navigation has found the solution of this problem in the navy training courses, which make excellent textbooks for class instruction, or for the voluntary study of ambitious men.

Some of these courses cover general subjects, such as mathematics, history, and English, but many of them, "rating courses," are compiled by officers in the Navy Department, to fit the exact needs of men in the various naval trades. Perhaps there is no other institution in which men know so definitely just what duties they must be able to perform and just what knowledge they must have, to be eligible for promotion to higher naval ratings. Promotions are made only after men have been carefully examined by a board of naval officers, and the rating courses are intended to include the exact material that will enable a man to meet the requirements of this examination. One hundred and twenty-five different subjects and ratings are now covered by the Navy training courses, and during the past year over fifty thousand courses were issued upon the requests of commanding officers of naval ships and stations.

Paralleling the great stream of young men drawn in from civil life to keep the enlisted personnel of the Navy up to standard strength, hundreds of picked men are taken in each year to the Naval Academy, where they must be trained to replace the losses in officer personnel. Like the enlisted men, those who enter the Naval Academy are young; they come from every state in the Union, and few have had any previous experience that bears directly upon their new profession. Part of them come as the appointees of members of Congress and the President, part are appointed from the enlisted men of the Navy and Marine Corps; but regardless of their manner of appointment, every one who enters must be able to pass one of the most rigid physical and mental examinations that has yet been devised for entrance to an institution of learning. The midshipman must also maintain a high standard of conduct and scholarship through four of the most strenuous years that any professional institution can prescribe for its novitiates.

The task of training midshipmen for the responsibilities that will devolve upon them as officers presents even greater difficulties than that of training enlisted personnel, for this training cannot be directed toward the development of specialized ability in one line. There are many subjects that every officer must know. In addition to the strictly military and maritime phases of his education, the naval officer must have a basic engineering course that will fit him to cope with the masses of highly developed machinery used in modern naval warfare. The man who succeeds in finishing his Naval Academy course gets this training; he receives a thorough indoctrination in military discipline; and most of all, he becomes habituated to attempting any task given him, and finding a way to do it.

The training and education of the officer does not end, however, when he leaves the Naval Academy. The training of the junior officers in his command is one of the responsibilities of every commanding officer. During his first years at sea the young officer is assisted and encouraged in the study that will do most to enrich and broaden the valuable practical experience he is receiving, and like all other naval officers, he is required to keep himself well informed upon advancements made in naval equipment. The best books dealing with

his profession are made available for him, War College correspondence courses are open to him as a voluntary means of self improvement, and thoroughly outlined reading courses are now being developed as another medium through which the ambitious officer may be kept professionally alert, regardless of his duty or location.

A wide variety of postgraduate courses are maintained for officers. Schools located at the Naval Academy and Naval War College prepare officers for every phase of command, from the duty of heads of departments on a vessel or the command of small craft, to the study of strategy for those who will hold positions of wide responsibility in time of war.

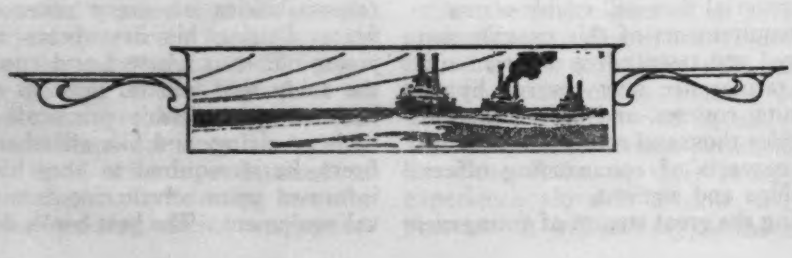
Courses for the specialization of officers in technical service are maintained at the Naval Academy and in civilian colleges. Mechanical engineering, electrical engineering, communication engineering, ordnance, and naval construction are only part of the subjects in which officers are being prepared for highly specialized duties.

With the great expansion of naval aviation, the bureau of navigation had a tremendous task confronting it in the selection and training of pilots and observers. This is especially so in heavier-than-air machines. All officers of the Navy have been given a special physical examination to determine their fitness for aviation. The fundamentals are studied by midshipmen at the Naval Academy, followed by an intensive course there after graduation. Indoctrinal schools for officers are held at the Naval Air Station, Hampton Roads, Va., and the Naval Air Station, San Diego, Calif. Such officers as are recommended for further training are assigned to the Navy's main aviation school at Pensacola, Fla.

Aviation training of enlisted men is also receiving the greatest attention in the bureau in order to improve conditions and increase the complement of trained, experienced men who are vitally needed for aircraft carriers and aircraft squadrons. Selected enlisted men in the fleet who volunteer are sent to the school at Pensacola, and all designated "naval aviators," "naval pilots," and "observers" must pass through the rigid course there. For training in lighter-than-air craft, to man the *Los Angeles* and other craft to be laid down, a school is conducted at Lakehurst, N.J.

Through newspapers, magazines and moving pictures, the average American learns a great deal about naval ships and their equipment. Personnel, the human factor in naval strength, has naturally received much less publicity through popular sources of information. The picture of a great ship rushing through the water at automobile speed or of a 16-inch gun firing a projectile that weighs two thousand pounds and strikes a target fifteen miles away is much more dramatic than a picture of officers and men, down in the hot engine and boiler rooms, working to make speed possible. There is nothing particularly dramatic about the unending and often tiresome gun drills that occupy officers and men for months before target practice, but without the training given men in these drills the big guns would be almost as harmless in battle as they are upon the moving picture screen.

The proper training of officers and men will always be one of the Navy's most important responsibilities; for the human factor must not fail in time of need. The efficient ship is the one whose officers and men are trained to operate guns and engines with maximum efficiency; to maintain a perfect system of visual and radio communications, and to perform efficiently all of the other widely varied duties which go into the upkeep and operation of a modern man-of-war.



Activities *of the* Medical Corps, United States Navy

By Rear Admiral E. R. Stitt, *(MC), Surgeon General, U. S. Navy*

THE primary purpose of the medical department of the United States Navy is to keep the men of the Navy physically fit to carry out their duties in peace and war. To accomplish this it is necessary for the medical department to keep itself well informed as to what advances are being made in medicine—particularly in preventive medicine—and to conduct for itself considerable research into the problems which arise as the result of changing conditions of life in the Navy. In the old days, these problems were relatively simple, as they were mainly concerned with the sanitation of surface ships of few types only. Today, not only does the personnel of the Navy live upon surface ships of many and varied types, but it also spends much of its time beneath the surface of the sea and in the air above. Submarine and diving activities, and aviation, have introduced problems connected with the human element as well as those of a purely technical nature. It is the human element with which the medical department is most intimately concerned and for the safety of which it feels the deepest sense of responsibility.

Aviation, the newest art which has been adopted by the Navy, has brought many and serious problems for the medical officer. Engineers may develop machine and engine to the point of perfection; fuels may be developed which will give greatly increased mileage and safety; methods by which planes may be kept afloat on the surface of stormy seas may be perfected; but, unless the pilot is properly selected, flying will always be attended with extreme risk. It is the naval medical officer upon whom rests the responsibility of deciding who is fit, temperamentally and physically, to undergo training in aviation. The officers of the aeronautic organization of the Navy give the training to the student flier and determine his fitness—or lack of it—to become a pilot. It is the specially trained naval medical officer, however, who determines who shall begin instruction. Methods for the examination of candidates for aviation training have been devised in many countries. The best of these have been adopted by our own flight surgeons and are made use of in examinations preliminary to training and during training. Not satisfied with tests developed by others, but wishing always to find methods which will give better results than any yet devised, the Navy's flight surgeons are engaged in constant research which will necessarily lead to the discovery of means and methods by which examinations may be conducted with a greater degree of accuracy than is now possible.

A school for flight surgeons is conducted at the United States Naval Medical School, Washington, D.C., in which naval medical officers are given the special training required to enable them intelligently to examine candidates for aviation training. Special methods of examination of eyes and ears are taught, as well as how to make a complete personality study of the individual. In addition, a review of the basic medical sciences is given. At this school the newer methods of examination are studied and applied, some to become a part of the permament equipment of the flight surgeon, some to be discarded as of little or no value.

The Ruggles Orientator—essentially a cockpit of an airplane suspended in three concentric rings—is now being studied. By means of a graph attachment which has been developed, it is possible to measure and record the reaction time of the candidate under conditions simulating those of actual flight. Thus, it is possible, with safety to the candidate, to put him through the evolutions of a plane in flight and study his reactions to various difficult situations.

An apparatus is being developed by Lieutenant Commander Poppen, instructor in aviation medicine at the Naval Medical School, which is still in the experimental stage, but from which much of real worth is expected. The apparatus is essentially on the pursuitmeter principle. It will measure speed and accuracy in the performance of tasks and accumulate the results in numerical terms, thus eliminating, in a large measure, the error of personal interpretation. An indicator automatically activated by a cam mechanism moves at irregular speeds and with irregular changes of direction through an arc of ninety degrees. Another indicator is independently controlled by a hand lever. The candidate attempts to keep the two indicators in apposition. When he fails in this task, an electric circuit is closed and a time device which records his error in terms of seconds per minute is activated.

In addition there is an auditory task. A noise which can be stopped only by the examinee is produced. The length of time taken by the examinee to stop the noise by pulling a trigger in a hand lever is automatically recorded.

This apparatus has many advantages over that ordinarily used in conducting psychological tests. Among these may be mentioned the following: the tasks are automatically introduced; the results are automatically recorded and are absolutely independent of personal interpretation by the examiner; results may be read at the end of successive minutes or at the end of a definite period; it is simple in operation; it can be used either to classify individuals or to measure progressive performance under any kind of natural or artificial embarrassment.

Deep diving presents problems which call for much study on the part of naval medical officers. The diving personnel must be carefully selected. Caisson disease, more commonly known as "bends," calls for much investigation by the medical officer in order that a complete understanding of its etiology and pathology may be had, so that methods for its prevention and cure may be devised. Intensive study of medical problems connected with diving is being made at the diving school in the Washington navy yard, where an experimental tank has been constructed in which all conditions met with in actual diving operations may be simulated. As a result of this study diving will be made safer for those who practice it.

Life in a submarine submerged beneath the waters of the sea is an abnormal one at best, but, by study of conditions as they are, much has been and is being learned that will greatly increase the habitability of these craft and lead to greater safety in their operation.

Chemical warfare is a comparatively new development which has introduced problems to be solved by medical officers. At Edgewood Arsenal a naval medical officer is attached to the medical research division and all classes at the Naval Medical School spend a short time there studying the effects of poison chemicals—gases and liquids—and methods for the prevention and cure of their injurious effects.

Much of the research conducted at Edgewood Arsenal by the Navy's medical representative, Commander E. W. Brown, Medical Corps, U. S. Navy, is of such a nature that its results are of use in times of peace as well as in time of war. Industrial plants have found useful a method of treatment of phosphorus burns with a solution of copper sulphate which was devised at Edgewood. A study of the comparative values of various methods used in the treatment of carbon monoxide poisoning has been carried on there, and an investigation has been made of the toxicity and inflammability of substances used as refrigerants in various types of ice machines.

Tropical medicine has ever furnished a field for study by medical officers of the Navy and much has been learned and published by them of far-reaching effect. During recent years the field of study of tropical diseases has been widened by the acquisition of Guam, Samoa, and the Virgin Islands, and by the establishment in Haiti of an efficient public health service under the direction of naval medical officers. In all these places much has been accomplished and the medical corps of the Navy points with great pride to the better physical conditions under which the inhabitants of these islands now dwell, and to the part played by the Navy in bringing about the betterment.

In Haiti, modern sanitation has been introduced throughout the island; drainage projects have already reduced the incidence of malaria; modern hospitals have been established in ten localities; a 500-bed hospital

has been constructed in Port-au-Prince which is operated in connection with a new and well-equipped medical school, in which native Haitians are being trained in medicine. These native physicians will soon be widely scattered throughout the republic, where they will take over and carry on efficiently the splendid work which has been instituted by the Navy.

In Guam, gangosa has been practically eradicated. Typhoid fever, formerly extremely prevalent, is now unknown there, thanks to the efforts of naval medical officers.

In Samoa, modern sanitation now prevails. Native nurses have been trained and are doing fine work, particularly in looking after maternal and infant welfare.

The Virgin Islands presented similar problems at the time of their acquisition by the United States, and these have been satisfactorily solved by the medical corps of the Navy.

As has been stated before, the first duty of a naval medical officer is to look after the health of the men and officers of the Navy and to exert every effort to see that they are, at all times, fit to perform their duties efficiently. Most of what has already been written might lead the reader to believe that our efforts are chiefly directed towards improving the lot of our wards in their tropical homes. This is not a fact. Where one medical officer is engaged in this beneficient work, scores are occupied with their duties on board ship, in naval hospitals, or at navy yards or naval stations. Others are serving with the marines, either in barracks or in the field with expeditionary forces. At present, of course, many are busily occupied with the marines in China and Nicaragua, where they are fulfilling with credit their arduous duties.

A naval medical officer is as much a specialist as anyone engaged in the practice of any branch of medicine, and there is no specialty in which it is more essential to have a well-grounded and complete knowledge of the basic medical sciences and the arts of medicine and surgery. The medical officer must be prepared to meet any medical or surgical emergency which may arise on board a ship far from assistance; he must be able to remove an appendix, a gall bladder, a kidney, or a spleen; he must be a fracture expert and know when to operate in cases of skull injury; he must be always on the alert to recognize the earliest signs of contagious diseases and to take prompt steps to prevent their spread; also, he must be a sanitary engineer, in order that he may advise correctly as to the location of camp sites, the proper methods of sewage disposal, and the safeguarding of water and food supply; he must be familiar with the prevalent diseases of the many countries visited and know how to protect against them; he must know something of international law as it affects ships in peace and in war; he must know all about ventilation; and, finally, he must be a psychologist with an understanding of the mental attitude of the sailor.

A few references to the annual report of the surgeon general, United States Navy, for the fiscal year 1927, will serve to show that the life of the naval medical officer is a busy one and that he has not failed in fulfilling satisfactorily his mission.

During the fiscal year 1927, the maximum number of officers of the medical corps was 827. The total naval personnel for whose physical condition these officers were responsible numbered 113,756. If these were gathered together in one community the number of doctors would be excessive. Such, however, is not the case. The personnel is split up into many groups, some large and some small. A small group in an isolated community requires the services of a medical officer as much as does a larger group in different surroundings. Small ships, performing duty away from the fleet, must have a medical officer to care for any emergency that may arise. Expeditionary forces require a large staff of medical officers because of the types of duty which they may be called upon to perform. Naval hospitals, in order to be efficiently administered and to render the type of service due the sick or injured of the Navy, must have specialists in all branches, as well as younger officers in training. As has been already shown, the services of many medical officers are required for the care of the natives of our tropical possessions and to administer the health service of Haiti. Other medical officers are serving with the *gendarmerie* of Nicaragua and Haiti. Thus it is readily seen that the number of medical officers is not excessive. On the contrary, it is very difficult, at times, for the bureau to find

enough officers to fill the necessary places.

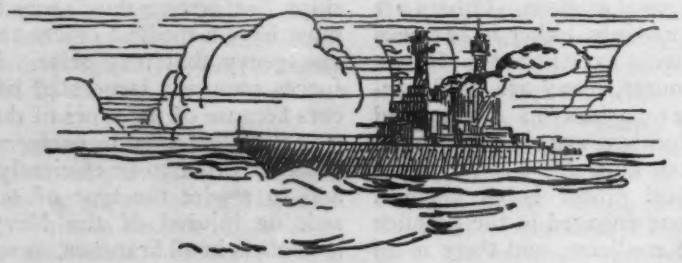
Medical officers are constantly undergoing instruction in institutions of higher learning in order that there may always be a sufficient number of specialists on hand. This, of course, reduces the number available for more strictly naval duties.

During the calendar year 1926, there were, altogether, 58,522 admissions to the sick list. Many, if not most, of these were for diseases or injuries of such a minor character that, in civil life, the patient would have continued at his work of earning his livelihood. The Navy, however, ever mindful of the health of its personnel, rightly admits its men to the sick list and relieves them from duty for comparatively slight cause in order to prevent the minor ailment from becoming a major one and to protect others from infection.

There were, during the year referred to, 929,139 days of treatment in naval hospitals, seventy-three per cent of all sick days. In other words, there was an average of 2.2 per cent of the personnel under treatment in hospitals at all times during 1926. Many of these were patients who would have received treatment at home or in a doctor's office had they been civilians. Others were sent to hospitals in order that a correct diagnosis might be made.

The death rate from all causes in the Navy for the year 1926 was 3.03 per 1,000. This was the lowest rate ever established in the Navy and is one in which the medical corps takes satisfaction, as it shows clearly that the efforts made to improve sanitary conditions and to give the best treatment to the sick and injured have not been without effect.

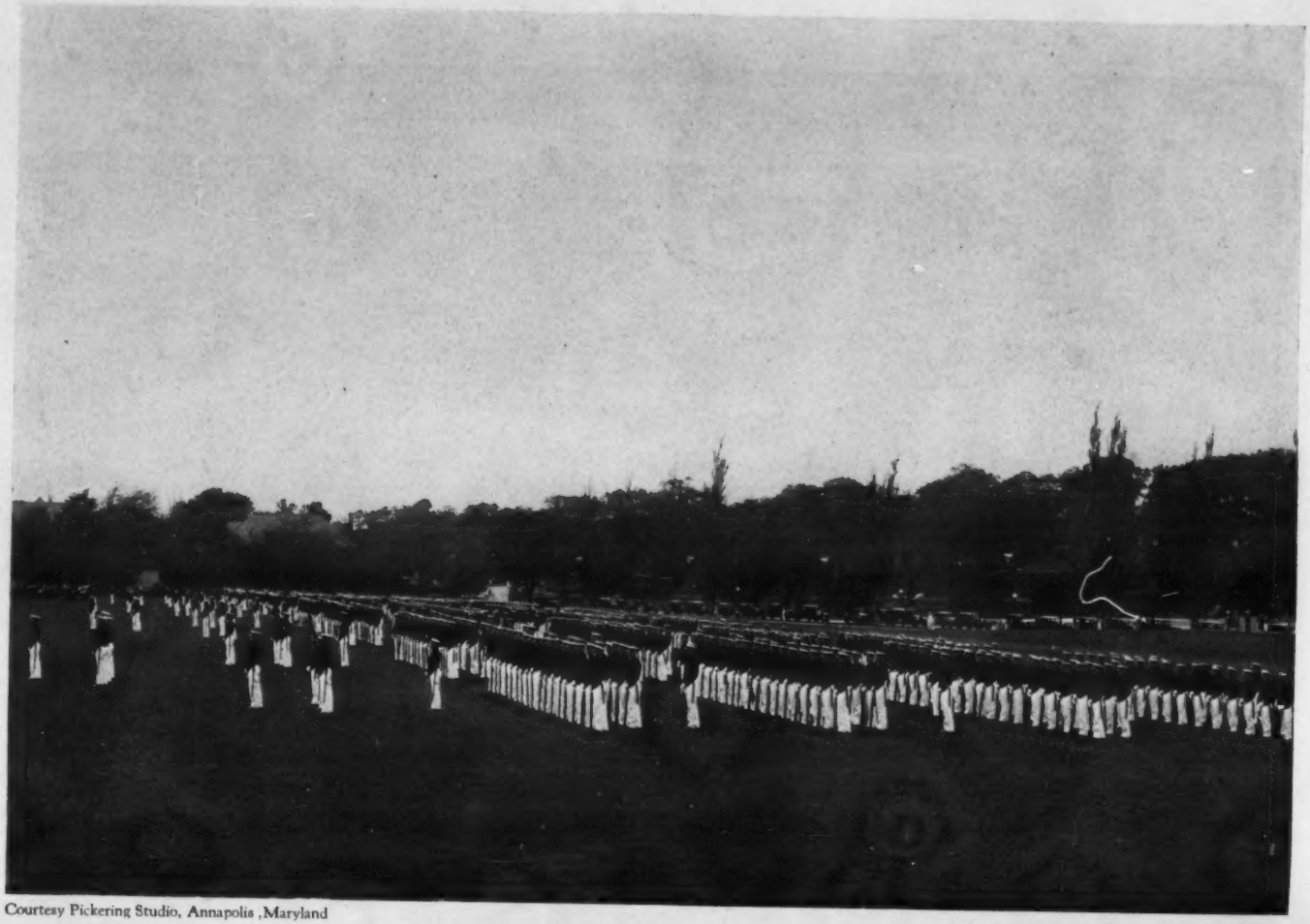
From what has been written anyone will see that the life of a medical officer of the Navy is a strenuous one. Every man must do his part in order that the work may be accomplished. With all the work, however, there is sufficient time for recreation and study, both of which must be included in the medical officer's routine if he hopes to keep himself in the proper physical and mental condition to enable him to carry on his work with satisfaction to himself and to those whose care is entrusted to him.



IN QUIET BEAUTY

A view of the Naval Academy chapel with Dahlgren Hall at the right. The chapel was designed by Ernest Flagg.

Courtesy Pickering Studio, Annapolis, Maryland



Courtesy Pickering Studio, Annapolis ,Maryland

ON SEVERN'S SHORE
Regiment of midshipmen at dress parade, June, 1928.

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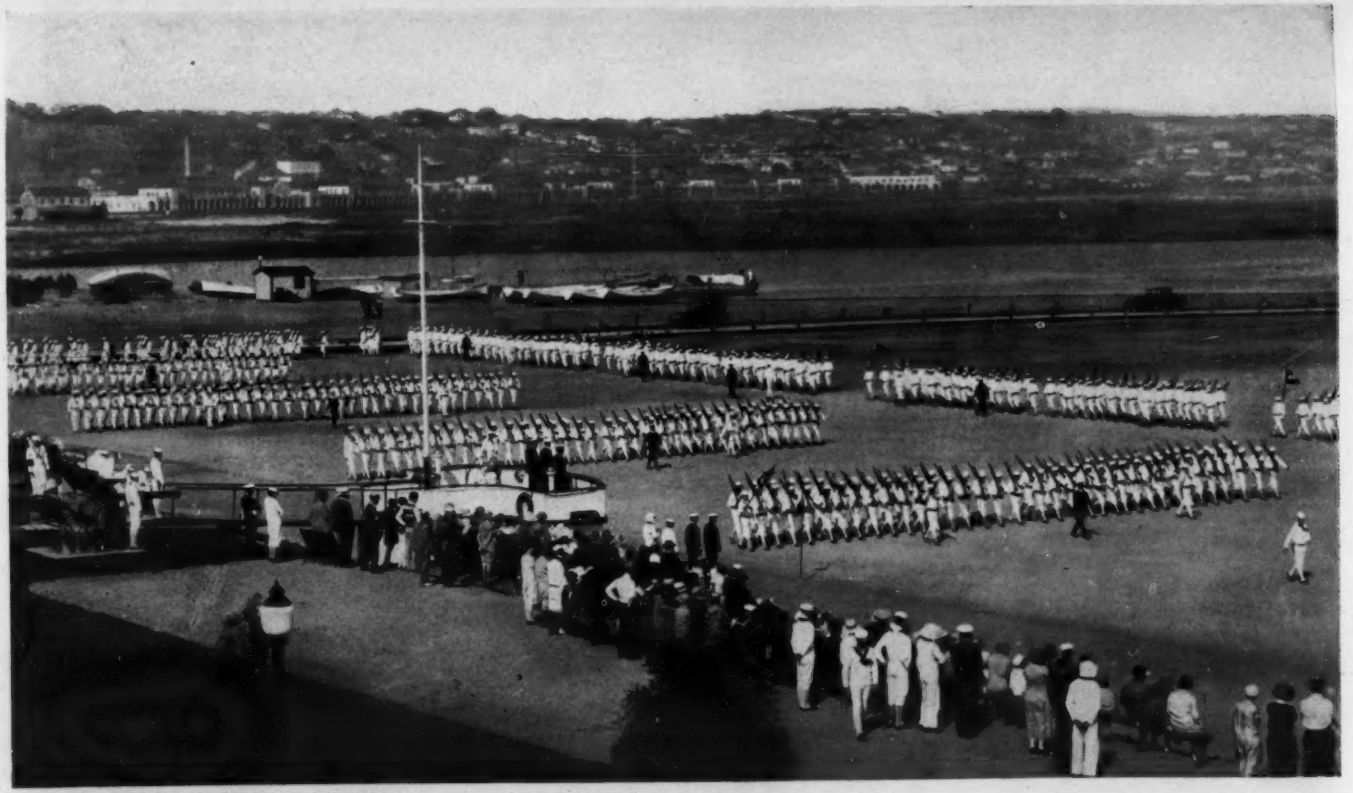


Courtesy U.S. Naval Training Station, San Diego, California

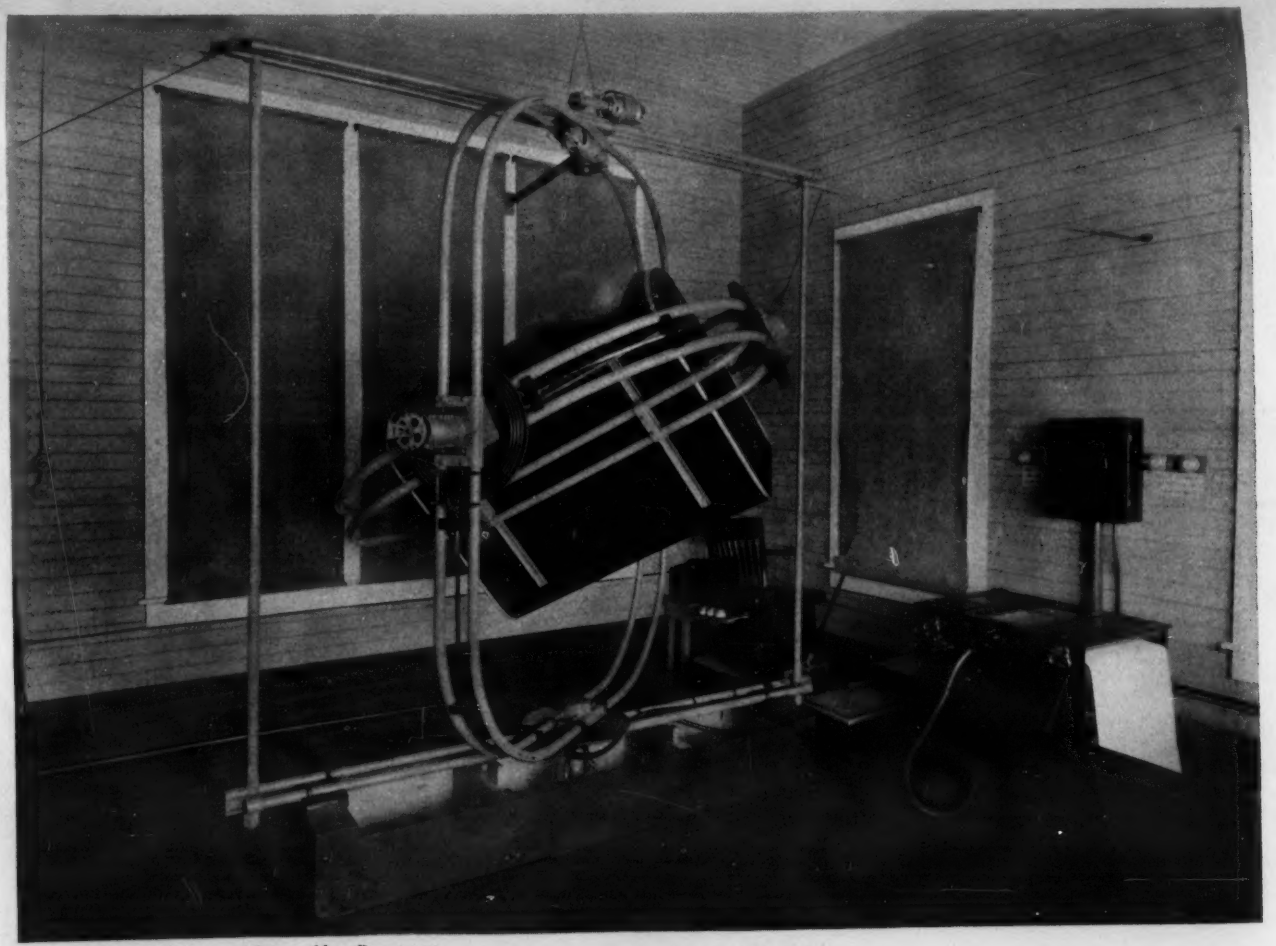
BLUEJACKETS AT DRILL
San Diego training station is the training center on the West Coast.

Courtesy Bureau of Aeronautics, Navy Department

AIR VIEW OF NAVAL TRAINING STATION, SAN DIEGO, CALIFORNIA

Courtesy Bureau of Aeronautics, Navy Department

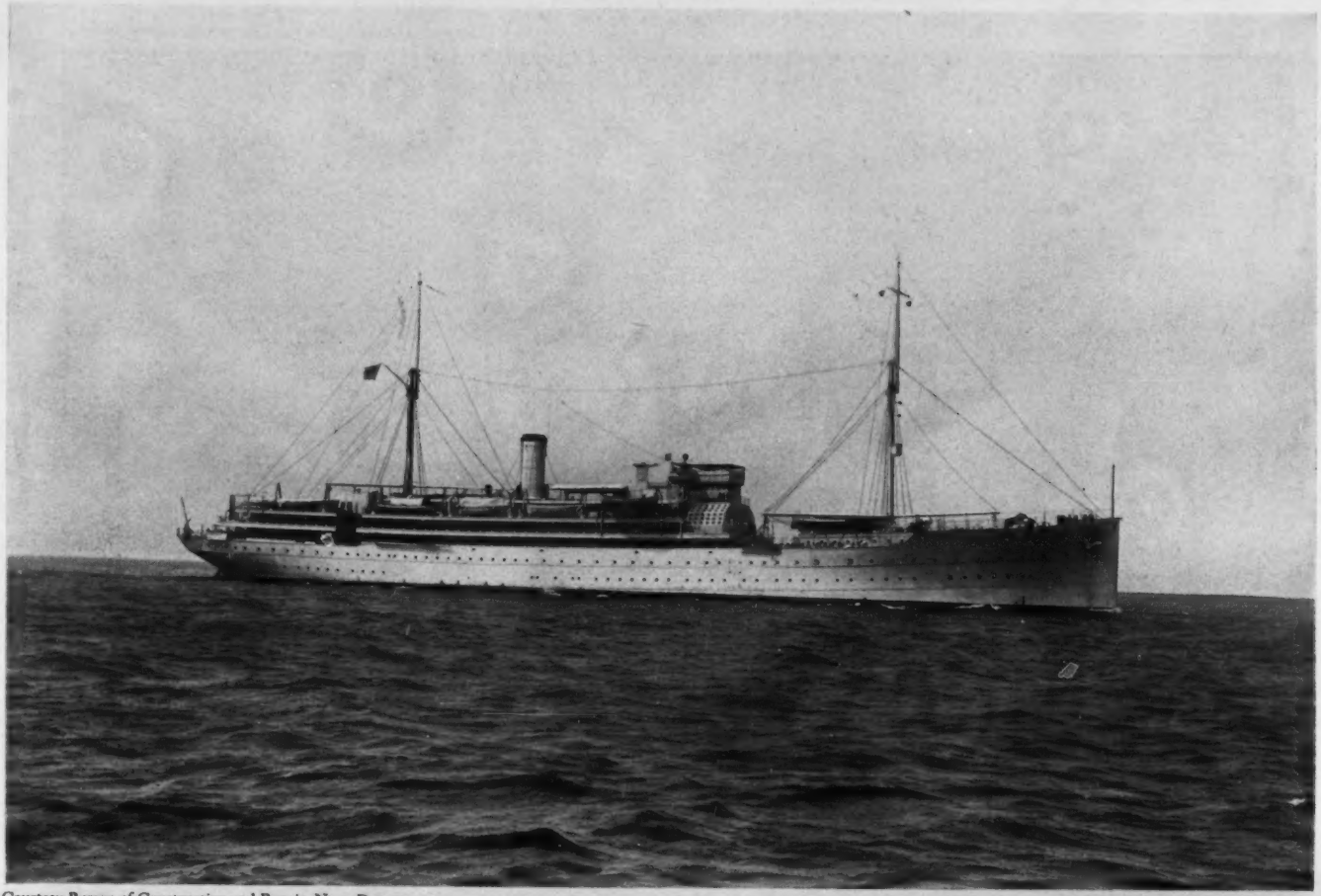
AIR VIEW OF NAVAL TRAINING STATION, SAN DIEGO, CALIFORNIA



Courtesy Bureau of Medicine and Surgery, Navy Department

WHAT MAKES THE WORLD GO ROUND

Research in aviation medicine by the medical corps, U.S. Navy. Adaptation of an electric recording apparatus to the Ruggles Orientator in studying reaction to change of position in space, and flying adaptability.



Courtesy Bureau of Construction and Repair, Navy Department

A SEAGOING HOSPITAL

The U.S.S. *Relief*, which, with her sister ship, the *Mercy*, accompanies the fleet to insure that proper hospital facilities are available.

Courtesy Bureau of Construction and Repair, Navy Department

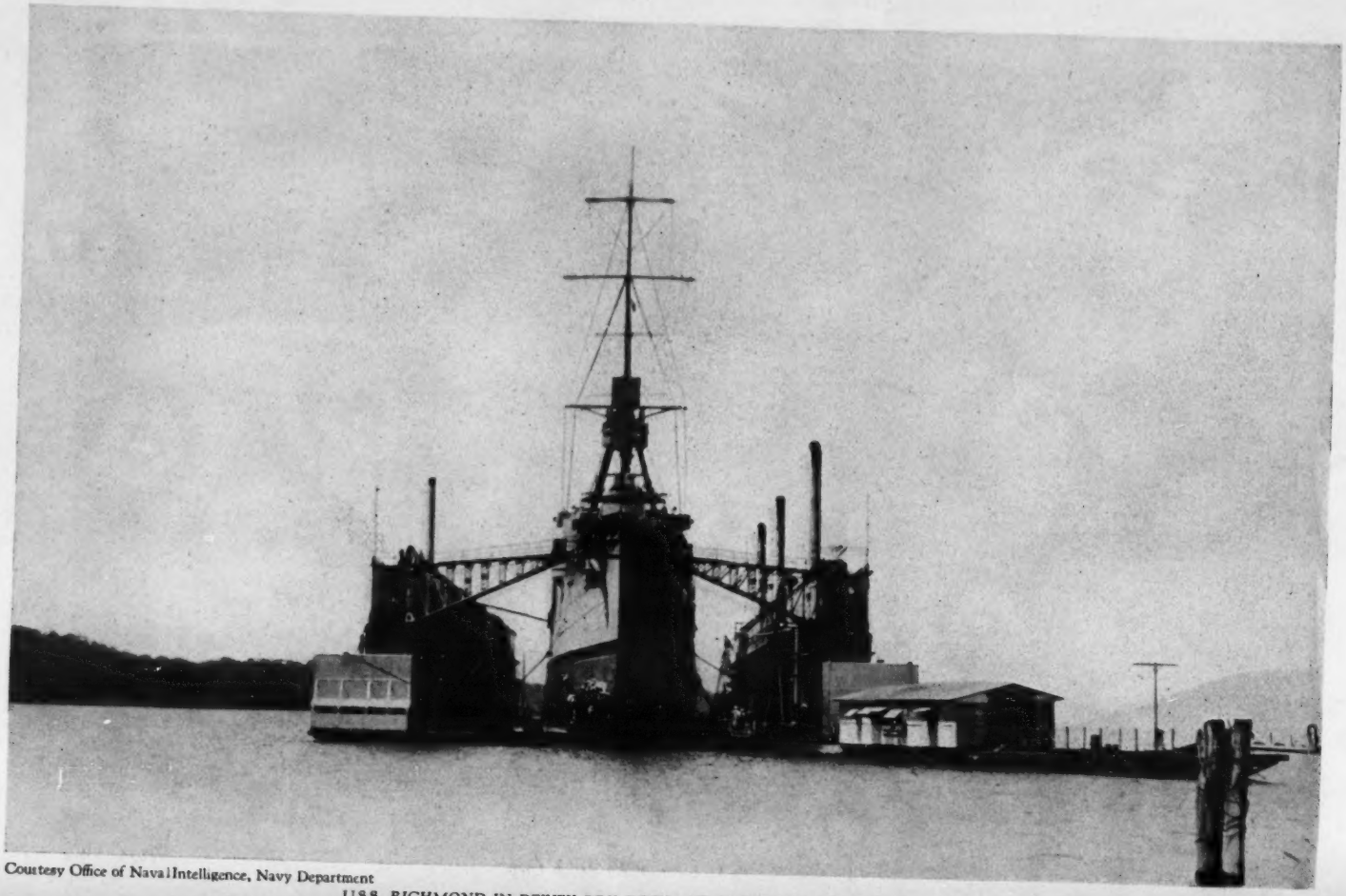
A SEAGOING HOSPITAL

The U.S.S. *Relief*, which, with her sister ship, the *Mercy*, accompanies the fleet to insure that proper hospital facilities are available.

Courtesy Bureau of Medicine and Surgery, Navy Department

U.S. NAVAL HOSPITAL SAN DIEGO, CALIFORNIA

For the care of the personnel of the Navy in that vicinity, and also for veterans of the World War in need of hospital treatment.



Courtesy Office of Naval Intelligence, Navy Department

U.S.S. *RICHMOND* IN DEWEY DRY DOCK AT OLONGAPO, PHILIPPINE ISLANDS

Is America *at* Sea?

By ALFRED H. HAAG

Director Department of International Shipping, Georgetown University, School of Foreign Service

WE ARE confronted by a lamentable situation in matters affecting our national security. We have among us two kinds of propagandists, i.e., first, the foreign propagandist who assumes the rôle of pacifist in order to further the interest of his own country to the detriment of ours; secondly, the well-meaning pacifist who becomes the unwitting tool of the foreign propagandist and who is used as a cat's-paw in furthering the interests of foreign governments. Can it be possible that the opinions and advice of such persons will receive serious consideration as against the sound judgment of those who have studied the subject and who have had opportunity to observe the activities of nations from both commercial and military standpoints, which few, if any, pacifists could have had opportunity or time to intelligently study?

In order that the American people may get a correct understanding of the situation affecting our sea-power, the United States naval policy based on the Washington treaty for limitation of naval armament is quoted in part:

> The treaty for the limitation of naval armament, when promulgated, will be the supreme law of the powers party to the treaty governing their naval armaments as to capital ships and aircraft carriers. The spirit of the treaty indicates two elements of international import: A general desire to avoid competition in naval armament; a partial recognition of a ratio in naval strengths as a means of avoiding competition. Were any power now to undertake a program of expansion in unrestricted classes of naval vessels or in personnel not consistent with the treaty ratios of capital ships, a new competition in naval strengths would thereby be initiated.
>
> Until such time as other powers by inequitable conduct in international relations as to United States interests or by their departure from the idea of a suspended competition in naval armaments, indicate other procedure, the Navy of the United States may be governed in naval strengths by the spirit of the capital ship ratios, otherwise it will be necessary appropriately to readjust our naval policy.

The intent of this policy can be construed in but one way, that in spirit and principle the naval ratio adopted for capital ships was intended to apply to all types of combatant ships.

What has been done since the Washington arms conference toward carrying this idea into practical effect?

The records disclose that the naval building activities of the Washington-treaty nations for vessels laid down or appropriated for, contracted for, built and building, credit the British Empire with fifty-five vessels of 335,769 tons; Japan, 127 vessels of 401,361 tons; France, 120 vessels of 291,785 tons; Italy, seventy-one vessels of 151,374 tons; and the United States, with nineteen vessels of 157,790 tons.

The United States scrapped approximately 850,000 tons of naval vessels, among them some of the most modern naval craft. This scrapping program cost our nation close to 400 million dollars. Incidentally had these vessels been completed, America would have attained world naval supremacy. America, however, acquiesced in the scrapping of these vessels in the hope that this sacrifice would prevent further naval competition, thereby assisting other nations by the curtailment of their naval expenditures to divert these funds to the restoration of these nations to their normal peace-time activities.

From the figures disclosed by the building activities there seems to have been no let-up in the building of other than the capital ships. This means that we are not on a parity with Great Britain in naval strength as was originally intended, and that with respect to other nations the United States has dropped considerably below the ratio agreed to in principle at the Washington arms conference.

When the Geneva arms conference was called, two of the nations a party to the

U.S.S. RICHMOND IN DEWEY DRY DOCK AT OLONGAPO, PHILIPPINE ISLANDS
Courtesy Office of Naval Intelligence, Navy Department

Washington conference did not participate. The purpose of this conference was to definitely carry into effect the principle and spirit contained in the United States naval policy based on the Washington treaty for the limitation of naval armament, to definitely apply the ratio now existing for capital ships to other types of combatant vessels.

At the Geneva conference we had nothing to give; the other nations did. If the spirit manifested at the Washington arms conference had been adhered to there would have been no need for the Geneva conference. The deliberations at the Geneva conference centered on the cruiser situation, the arming of merchant vessels, and the protection of trade routes.

The conference ended in a deadlock, and were it not for the fact that the question of merchant ships was so prominently brought into the picture the Geneva conference would have been recognized as a complete failure. As it was, the recognition by the conference of the vital importance of merchant vessels as an indispensable factor toward naval strength must obviously be regarded as a constructive measure. In this light our weakness was very forcibly revealed to the American people.

The records show that since the completion of the war-time shipbuilding program, not one ship has been constructed in American shipyards for the overseas foreign trade and that we have been outbuilt in modern competitive types of ships by all of our trade competitors.

During the period 1922-27, covering ships of 2,000 gross tons and over for transoceanic service, we find that out of a total of 1,300 ships, of approximately eight million gross tons, the United States is credited with eighteen ships of less than 200,000 gross tons, thus being outbuilt by Great Britain by almost fifty to one; by Germany more than ten to one; by France more than five to one; by Italy almost five to one; and by Japan more than four to one.

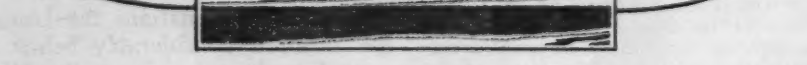
It is inconceivable that the costly experience in depending on ships of our competitors to move our commerce and the lack of merchant vessels to serve as naval auxiliaries should be so soon forgotten.

To produce ships during abnormal times is a costly procedure. It cost the nation for that last experience three thousand millions.

The vital fact is that since the Washington arms conference not only have our competitors made great gains in their naval building activities, but they have left us far behind in the building of merchant tonnage. We must not lose sight of the fact that the sea strength of a nation consists of its naval and merchant vessels and these combined compose the real sea-power, each serving the other. Therefore, when we speak of naval ratios and naval equality, unless we take into consideration both our naval and merchant vessels as a basis to establish ratios, the comparative naval strengths have little or no significance.

Our country is credited with less than three per cent of the shipbuilding activities throughout the world. This has resulted in the present deplorable situation in our shipbuilding industry. Not only have we permitted our competitors to outbuild us in both naval and merchant tonnage, but we have permitted so important an industry as our shipbuilding to decline, which places us, from a standpoint of national defense, in a still further untenable position.

The time has arrived when we should no longer permit the advice and dictates of pacifists and foreign propagandists to influence us in establishing our commercial independence and in providing for national security commensurate with our position as a first-class commercial and maritime nation.



The Civil Engineer *in the* Navy

By Rear Admiral L. E. Gregory, *Civil Engineer Corps, U. S. Navy*

THE civil engineer corps of the Navy, even though one of the corps in a military organization, has from its inception retained its designation "civil." This professional title has been a heritage from the early days of the Republic when eminent civil engineers were retained for specialized work incident to the development of naval shore establishments. The problems met with and the types of shore construction necessary for the most efficient building and maintenance of a fighting fleet were such as to logically devolve upon the trained engineer. As a result the best engineering minds were utilized on the layout of stations and the design and construction of buildings, water-front facilities, and dry docks. Even though these structures were considered monuments to the master craftsmen of their day, we must stop and reflect in order to appreciate the multitudinous and complicated problems which confront the engineer of the present time. The strides in science and industry have in the last century carried the country forward in an era of progress heretofore unconceived and hardly capable of comprehension from generation to generation. The field of engineering has been one of constantly changing designs and methods of construction. With the advent of steam and electricity, iron and steel, concrete and many other materials utilized in present day engineering problems, this field is so broad that it can safely be said that our early engineers were specialists in a limited field.

Today the functions of the naval civil engineer are those of an investigator, an advisor, a designer, a supervisor, a constructor, and in some cases an operator. He must investigate a great variety of proposed projects and determine the best means by which they can be carried out; he must study and prescribe the methods of construction; he must supervise the construction of projects and see that the works created fulfill the designed functions. The work includes those branches of technical service embraced within civil, electrical, and mechanical engineering and architecture, and, since most of the major projects are constructed by contract, requires in addition an intimate knowledge of contract law. He must have a comprehensive knowledge of engineering principles, and also must exercise sound engineering judgment. In addition he must possess an intimate knowledge of the unique problems presented in the construction of the naval shore establishment.

The specialized functions of the naval civil engineer were recognized in a law of 1842 which established the bureau of yards and docks by the creation of an office of civil engineer in the bureau. It is believed that the problems encountered by the officers in this corps are comparable in scope to those of any other engineering organization in the country. The fighting ships and auxiliaries of our fleet are not designed to fit the facilities of the shore stations. On the contrary the shore stations and facilities must be adapted to provide for the most efficient operation of the fleet. The result is a great variety of shipbuilding, industrial, and storage facilities, power plants, distribution systems, hospitals and training stations, dry docks and marine railways, cranes, quay walls, piers, hangars, radio towers, marine barracks, coal and fuel oil storage, ordnance buildings, and submarine bases.

While doing his part in maintaining the naval shore stations in a ready status at all times, the transition from peace to war or other national emergency makes greatly enlarged demands upon the civil engineer. It becomes necessary to take unaccustomed yet sound measures for the rapid design and construction of great emergency works. Seagoing officers are absorbed in their particular activities, requiring that the civil engineer assume additional executive re-

sponsibilities in expanding the shore establishments.

The naval civil engineer is charged with the design, construction, preservation, and maintenance of real property, public works and public utilities of the naval shore establishment representing an investment of the public's funds exceeding five hundred million dollars. One of his important peace time problems is to maintain this enormous investment in the best state of preservation with the limited funds appropriated annually by Congress. He must see that the navy yard power plants are dependable and operated economically; he must make accurate surveys on fresh water used on stations with a view to eliminating waste; he has charge of the construction and maintenance of telephone systems.

The naval committee of the House of Representatives, in a report of January 28, 1911, on the pending naval bill, stated:

> In order to facilitate a better coördination of work in the matter of public works, the committee has consolidated under the bureau of yards and docks all the public works of the entire naval establishment. This bureau is controlled by the corps of civil engineers in the Navy, which is a corps of officers especially trained in construction work at navy yards and stations.

All formal estimates for appropriations for public works for the Navy are prepared by the bureau of yards and docks. Each station prepares annual estimates for the improvements considered necessary. These estimates are usually prepared by the civil engineers assigned to the stations and are accompanied by plans showing the location and design of the improvement.

The work of the bureau of yards and docks is of prime military importance. All that part of naval strategy which concerns itself with dock yards, coaling stations, supply depots, and naval bases, presupposes the efficient operation of the activities delegated to this bureau. Without shore facilities in the United States and its insular possessions, the Navy would cease to function as a military organization, and within a brief period, in either peace or war, the fleet would become an aggregation, first of floating hulks and, last of sinking derelicts.

Naval civil engineers are detailed to about forty-five distinct naval activities, including the Navy Department at Washington. In addition, the civil engineers assigned to the naval stations in Guam, Samoa, and the Virgin Islands have duties involving construction work performed by the island governments. Public works of the republic of Haiti are also under the charge of naval civil engineers in accordance with the existing treaty which provides for the detail of American engineers to assist the republic in the development of its public utilities.

At navy yards the senior officer of the corps of civil engineers is generally assigned as public works officer. The number of commissioned assistants depends upon the amount of work to be performed and the size of the activity. Navy Regulations prescribe that the public works officer of a navy yard shall, under the direction of the commandant, supervise and control all work assigned to his department, and shall have charge of the operation and upkeep of public works and public utilities. The public works officer of a large station is, therefore, the executive head of the public works department and has to concern himself principally with questions of policy, organization, contact with other departments, annual estimates and inspections, reports, and general supervision of all work perfomed by his department. He may have several junior assistants; for example, a principal assistant who acts as public works officer in the absence of the senior officer, and who has executive charge of the drafting force and the office personnel; one assigned to new contract projects and one to those performed by yard labor; one may be assigned to construction and repair of all district activities outside the navy yard, such as those at radio and radio compass stations, fuel depots, ammunition depots, hospitals, etc.; one in charge of the operation and maintenance of the central power plant; and one in charge of yard transportation systems, etc. At smaller activities such as air stations, submarine bases, training stations, mine depots, etc., there are generally one or two civil engineer officers on whom the above-mentioned duties devolve. There are also civil engineer officers assigned to miscellaneous duties, such as the director and the inspector of naval petroleum reserves; duty as student or on the staff at the Naval War College; others under instruction elsewhere; technical advisers to other bureaus or offices of the Navy Department; treaty engineers in Haiti, etc.

To Whom *the* Blame?

By Brockholst Livingston

"War is simply a political movement . . . ."—Mahan

CERTAIN questions arise when we consider the right to arm and defend a nation. Treitschke wrote:

The highest duty of the state is self-preservation. Self-preservation is for the state an absolute moral obligation. And therefore it must be made clear that of all political sins, that of weakness is the most heinous and despicable. The sin of weakness in politics is the sin against the Holy Ghost.

Pacifism, however, is wont to cast reflections on this duty which past ages have bequeathed to us. In the eyes of those who are, perhaps unintentionally, blinded, war has become a thing to be abhorred. And, oddly, the blame for war is put upon those who wear the uniform and carry the arms. The credit for such peaceful endeavors as have been begun goes to those who wield the pen and dress in the apparently more pacific garments of diplomacy. The armed forces are looked upon by most people as the cause of war. It is in an attempt to prove the fallacy of such belief that this discussion is undertaken.

If we are to delve into the rights with which the various branches of government are empowered, we must look to the instrument upon which is based our system of governing. Because of the varied interpretations now given this document, it is wise to follow back to its source and inquire what meaning was intended when certain clauses were inserted by its makers.

The most important duty of the Congress is the carrying out of such powers as are assigned this legislative body. Among those is the important one of providing for the common defense, (by) raising armies; (by) providing and maintaining a navy; and (by) declaring war (if necessary). Madison in one of his papers on the Constitution remarked: "How could a readiness for war in time of peace be safely prohibited, unless we could prohibit in like manner, the preparations and establishments of every hostile nation?" With this in mind, the Constitutional Convention made provision for "the common defense." This defense was to be confided to the federal government in order that better preparation might be had and the common facilities of the entire nation opened to this great task of preparing *against* war. The individual states, empowered to organize a militia, may not keep ships of war. The Union, alone, may maintain standing armies and ships of war.

The right to maintain armies and navies is questioned only by those whose outlook is blinded by an overzealous desire to rid the world of so-called war-making instruments. The use of armed force is something which may be properly or improperly executed depending on the *political* desires of the *politicians*. There have been cases when the politicians of a country were also its militarists. So far, America has not been thus afflicted. There seems no possibility of such a state of affairs. Our political make-up is a governor of such happenings. The Constitution was so wisely framed that no one branch of the government was permitted absolute control. We may have military control of this nation only when a majority of the Congress is held by what have come to be known as "militarists." From the way things have been moving lately, there is no possibility of such a change.

American government is, undoubtedly, the ideal one where the voice of the people is concerned. So far as is possible, the people are heard through their representatives in Congress. It was the wish of the majority when, in 1917, the joint session of the two Houses voted that a state of war existed between the United States and the government of Germany. It was the voice

of the people that resounded throughout the entire nation when men and money and munitions were cast into the lot which succeeded in breaking the power of the enemy and winning the war in which we were engaged.

To whom must go the blame for declaring the war which we now have happily concluded? Perhaps the pacifist, in his rambling way, would accuse the military. But who carried on the preliminary notes, the protestations and the repeated threats that war would result if certain acts were continued? Was it the Secretary of War? No. The Secretary of State, after the failure of his procedure, was forced to consult with the President who, acting in accordance with constitutional precedent, advised Congress to declare that a state of war existed and to use the armed forces in the carrying on of the conflict which he and his statesmen believed necessary to redress the wrongs done to this nation. It was not until after a state of war was declared by the Congress that the military and naval establishments became a part of the procedure and, following the desire of the people, brought Germany's strength to the point where overtures might be made for peace. The armed forces had had no part in bringing on the war and had no part in the conclusion of peace except to make secure any agreement which was entered into by the statesmen.

War, consequently, is, as Mahan has written, simply a political movement. We may consider the question of neutrality. Hamilton in his discourse on *The Utility of the Union in Respect to Commerce and the Navy* wrote: "The rights of neutrality will only be respected when they are defended by an adequate power. A nation, despicable by its weakness, forfeits even the privilege of being neutral." Neutrality, a movement of the statesman, is, consequently, only possible when it is backed by force—the military. How shallow neutrality is when it is but the utterance of a statesman, and yet its pronouncement comes from the statesman and force is only called upon when the weight of the spoken word is insufficient. Force, as we shall call the military and naval forces, has had no hand in the formulation of policy. It is not consulted. The statesman issues policy and, if necessary, calls upon force to war. Force is but an intermediary between policy and peace. Policy, having caused war, calls upon force to bring about a satisfactory peace by a victorious war.

No matter where we look in history, we find war the result of the statesman who, having failed in his negotiations, calls upon force to wage war. In our campaign against Mexico in 1914, when lives were lost at Vera Cruz, Woodrow Wilson, then President, addressed a gathering at the Brooklyn navy yard in memory of those who had been killed. In the course of his address he said:

> What gives men like these peculiar distinction is not merely that they did their duty, but that their duty had nothing to do with them or their own personal and peculiar interests. They did not give their lives for themselves. They gave their lives for us, *because we called upon them as a nation* to perform an unexpected duty.

We, the nation, had called upon these men to do their duty and they had died in its fulfillment. Can it be said that they were responsible for the conflict in which they perished? This bloodshed was the result of purely unmilitary actions. Neither the Army nor the Navy had had any connection with the causes which led to our occupation of Vera Cruz. The arrest of our seamen at Tampico was but a final insult to American sensibilities. The nation through its representatives, called upon the Navy to redress the wrongs which had been committed and, in the course of carrying out this task, our men were killed. They had performed their duty, but "that duty had nothing to do with them or their own personal . . . . interests. . . . . They gave their lives for us, because we called upon them . . . ."

It may seem strange to quote Woodrow Wilson in a discussion of this sort but, because of his great love of peace, his thoughts on the Navy seem especially well fitted to be placed along with those whose motives have been seemingly less pacific.

In an address in May, 1915, when the nations of Europe were struggling for the mastery of that continent and America was looked on as the deciding figure of the world, Wilson spoke on "The Ideals of the Navy." After outlining the ideals of the Navy—"a body specially entrusted with the ideals of America," he said:

> The mission of America is the only thing that a sailor or a soldier should think about. *He has*

nothing to do with the formulation of her policy. He is to support her policy whatever it is. . . . . So with every man in arms who serves the nation; *he stands and waits to do the thing which the nation desires.*

No one who has studied government can truthfully say that force has caused war. The purpose of force is to support but not to urge policy. The American Navy, even more than others, has properly carried out its purpose.

While force has no place until policy has decided for war, the greatest successes of the past have been found where the statesman and the military commander are one and the same person, or, failing that, where the statesman and the military commander are during peace in constant intercourse with one another, so that policy and preparation for war go hand-in-hand. This co-operation is necessary that force may be better able to understand policy and prepare for the possible and most probable wars into which we may be drawn by circumstances which are totally within the scope of policy. No matter how close, however, the relationship between the statesman and force, the decision to wage war is solely within the province of the former.

Wilkinson in his book, *War and Policy*, has brought out the failure of military histories to recount what has taken place prior to the opening of a war. He says: "Military histories almost always pass over in silence the transactions between the head of the state and his military advisers which as a rule precede the outbreak of war." Perhaps if we were to trace the course which policy has taken prior to war, we might find that force was as often for peace as for war.

As a specific example of the circumstances leading up to war, Wilkinson makes the following remarks in reference to the success of the French in the early Revolutionary wars:

> In 1805, Austria suffered the tremendous overthrow of Ulm and Austerlitz, usually attributed to the genius of Napoleon. No one will wish to underestimate the personal force of Napoleon. But he had the advantage of an army which he had carefully formed and organized for a campaign upon a grand scale. What was the position of Austria? At the head of her army in 1804 was the Archduke Charles, at that time the best commander in Europe after Napoleon. That general's papers have lately been published, and show that in 1804 he implored the Emperor to avoid a rupture with Napoleon . . . . and begged that if such a war were contemplated it should be postponed until after several years of hard work in preparation. He was overruled and deprived of his command. . . . . In 1808 he again protested against a new war with France, was again overruled, but this time persuaded to take the command.

Policy, having decided on war, overruled force with the results which we all know.

When nations disagree with reference to some matter, unless it be a trivial issue which does not involve their honor or integrity, there is no known way of settling the dispute other than by force. In minor matters, it has been feasible to refer the question to arbitration or to compromise. It is usually only serious questions which lead to war, for war is a serious matter. There are, however, times when it alone can rightfully decide the propriety of a claim or affront.

No matter where we open the history of the world, we find policy deciding the question of war, and force engaging in war at the behest of policy. Take, for example, our own war between the states. Was it not the civil government of the North which, to uphold the unity of the nation, called upon the military and naval forces to down the rising power of the Southern armies? And was not the might of the South employed in obedience to the policy of the provisional government which believed in its right to secede from the Union which the North held inviolable? In the crushing of rebellion or in the carrying of the flag to new lands, it is policy which decides, force which executes.

"War," says Spenser Wilkinson, "is merely a means to an end; it is a piece of political action." He agrees in this with every writer who has studied the subject and traced the origin of war. Since the power to declare war is in the hands of the civil authorities, the military and naval forces can have no part in plunging the nation into war. The bogy of standing armies and large navies being a cause of war is reduced to an actual myth since no matter how large the force, it, of itself, cannot bring about war. Perhaps with a limitation of statesmen, war will become less probable. Certainly, reducing armed forces will not bring about the result with which these endeavors are clothed. World peace is not a question of armaments but a question of human nature and statesman-

ship. Let the diplomats save us from war and we shall find armies and navies unnecessary.

In those stormy days when Wilson returned from the Versailles conference and attempted to persuade the people of the United States that the way to peace was through a League of Nations which would dictate to the world how it was to exist, certain statements were made which seem to have been forgotten by those who now wish to rid us of armaments prior to that day when men will cease to meet on the field of battle and will be willing to settle all disputes at the council table with no weapons sharper than the tongues of the trained diplomats. One of those statements by Wilson himself was: "Armed force is in the background in this program (the League), but it *is* in the background, and if the moral force of the world will not suffice, *the physical force* of the world shall." Accordingly, through the wishes of men who have known the ways of statesmen, provision has been made for the League to call on member nations to provide the armed forces which may be necessary to compel compliance with the dictates of this body. Even the League—a harbinger of peace—found it necessary to provide for armed forces. But, as always, force appears on the scene only at the call of policy.

Throughout the training of the American Navy, the point is held uppermost that force is but an instrument of policy. At the Naval War College, every lecture brings forth the fact that the Navy exists to serve the nation, not to formulate but to support policy. Captain Belknap impressed this when he stated:

> What it is in the nation's interest that the nation's military power may have to contend for can be answered only by the statesman. He, more than any other, is concerned in there being military power ready and adequate for any probable needs, for this is provision against forcible interference with the nation's lawful rights, lawful by nature. What those rights are and where, by whom, and when they may be forcibly contested are questions for the statesman.

In a speech in the House of Representatives last January, Congressman Frederick M. Davenport remarked: "The Department of State is charged with maintaining peace . . . . with getting rid of many strained relations which eventually may result in war. Its great function is to prevent war." He added, *"War is the failure of diplomacy."* Historian, military leader, and legislator all agree that war is an act of the statesman. Force cannot declare war. Policy alone is thus empowered.

It is needless to go further in our quest for the branch of government upon which to place the blame for war. We have seen that no blame can be attached to the military or naval forces. They, as we have said, are but the instruments of policy. Policy is not necessarily a *war-seeking* functionary. It is, however, only through this functionary that a state of war can be brought about. We have yet to find a single war of our history that was forced upon us by our armed forces. Each time we have gone to war it has been "because we called upon them (the military) as a nation. . . . ." Each time they responded and brought peace to a land that *policy* had plunged into war.

Courtesy of Mrs. H. A. Baldridge

A VIEW OF THE GROUNDS OF THE MAPLE CLUB, TOKYO

One of the many beautiful places where the American admirals, captains and officers of the battle fleet were entertained by the Japanese Government and Navy in 1908, during the fleet's visit to Japan in the trip around the world.

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

A BRIDGE AT HASHI, JAPAN

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

A BRIDGE AT HASHI, JAPAN

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

CHERRY BLOSSOM TIME IN JAPAN

Courtesy Navy Recruiting Bureau, New York

A GARDEN PARTY

Rear Admiral Sperry and senior officers of the Japanese Navy watching the dancing during a fête at Tokyo, Japan, 1908.

Courtesy Navy Recruiting Bureau, New York

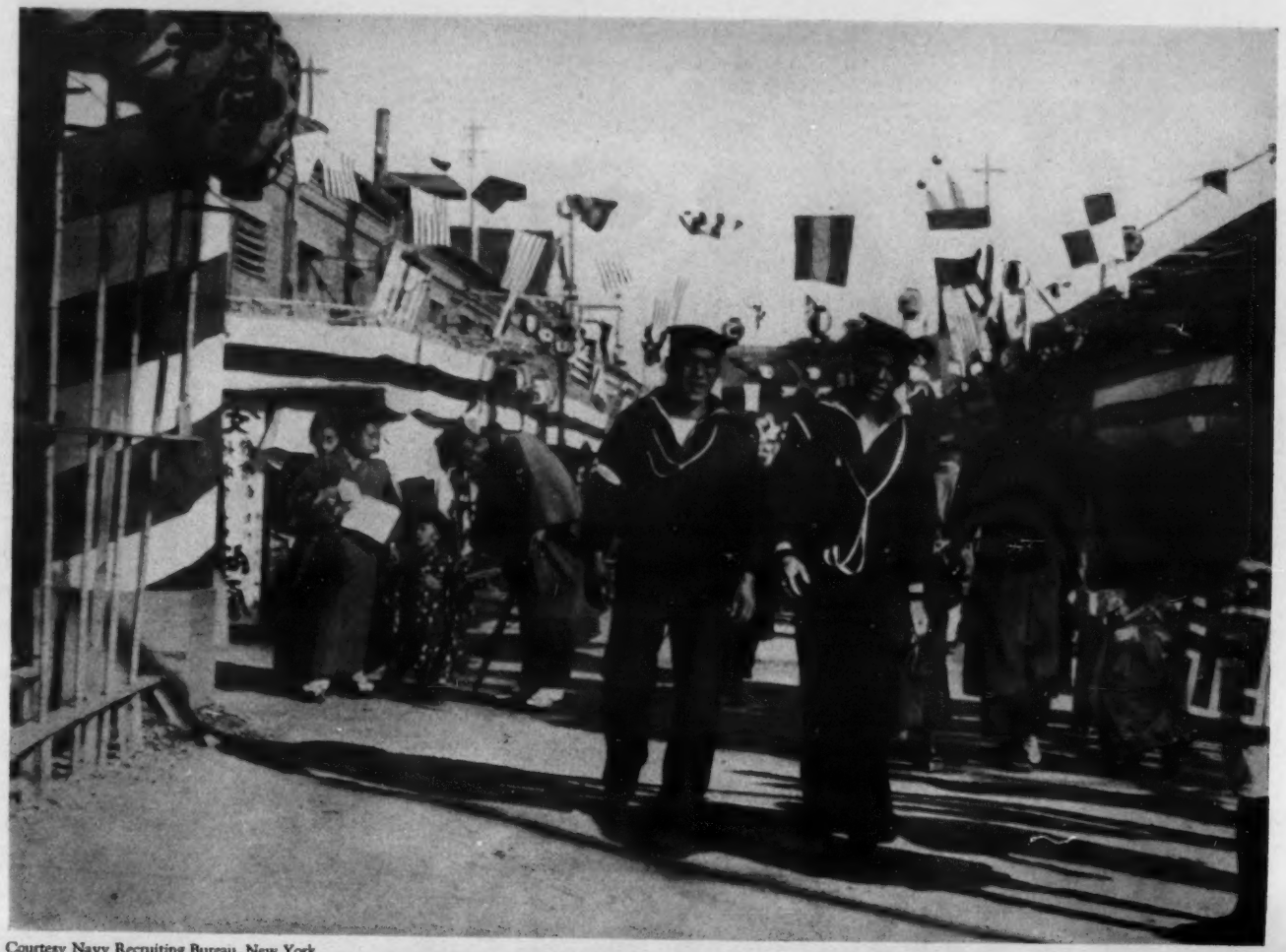
A GARDEN PARTY

Rear Admiral Sperry and senior officers of the Japanese Navy watching the dancing during a fête at Tokyo, Japan, 1908.

Courtesy Lieutenant Commander R. Wainwright, U.S. Navy (Retired)

BENTON DORI, YOKOHAMA, 1908

Typical of the gay decorations to welcome the fleet.



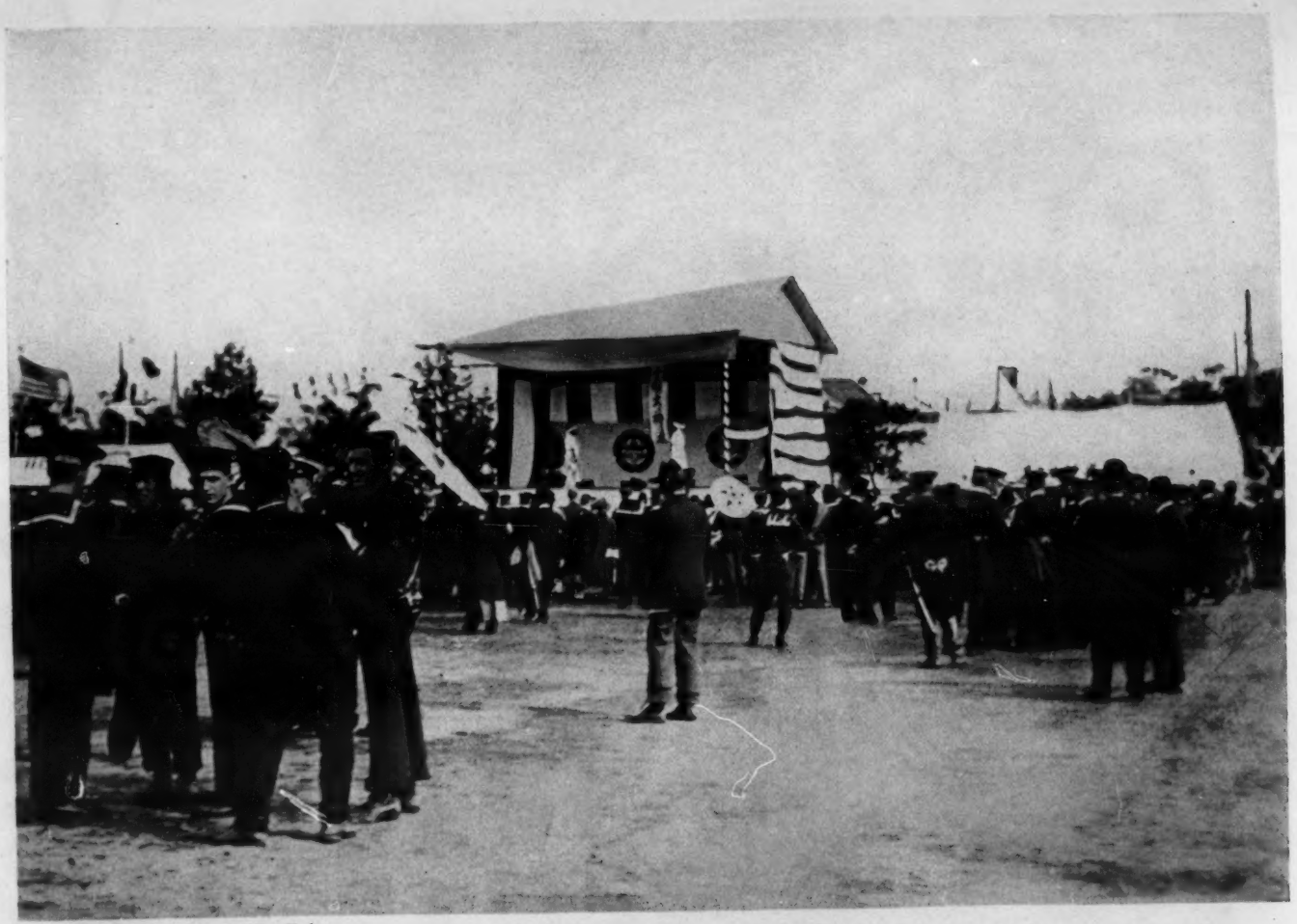
Courtesy Navy Recruiting Bureau, New York

ROLLING ALONG
Japanese bluejacket showing his American friend the sights, 1908.

Courtesy Navy Recruiting Bureau, New York

ROLLING ALONG

Japanese bluejacket showing his American friend the sights, 1908.



Courtesy Navy Recruiting Bureau, New York

OFFICERS AND MEN OF THE AMERICAN AND JAPANESE FLEETS ENJOYING OUTDOOR THEATRICALS

Courtesy Underwood and Underwood

JAPANESE SCHOOL CHILDREN VISIT THE FLEET FLAGSHIP, U.S.S. *CONNECTICUT*, AT YOKOHAMA, JAPAN, 1908

DISCUSSIONS

Courtesy Underwood and Underwood
JAPANESE SCHOOL CHILDREN VISIT THE FLEET FLAGSHIP, U.S.S. CONNECTICUT, AT YOKOHAMA, JAPAN, 1928

An Ancient Overseas Campaign

(See page 201, March, 1928, PROCEEDINGS)

DR. ING. WLADIMIR V. MENDL.—In his most interesting article Commander Stiles refers with some very valuable remarks to the vessels used by the ancient Greeks in their campaigns (page 203) and the end of the article reproduces "A Greek war galley with two masts" (page 211). May I be allowed to supplement the latter.

Looking at the sails of this galley it would seem as if it is driven towards the right. But this would mean that it makes stern way, as the right extremity of the galley shown is the stern and the left one the stem. Not only is the helmsman sitting near the right extremity, but as Commander Stiles states very justly, as a rule the Greek vessels were hauled up the beach during the night stern first. For this purpose the rounded up extremity is the best suited one.

Furthermore it is obvious that the left extremity must be the stem, because the tactics of the ancients were to ram the enemy so as to break his oars if not sink the vessel, and this can be accomplished only with the ram. This ram—called *embolon*—was armed with iron or bronze and was the continuation of the foreship, built heavier so that it could endure the ram blows. Above the ram and at about the same height as the tier of beams was a second ram called *proembolon*—intended, according to the oldest authors, to destroy the oars of the enemy when passing very close to him, while some younger authors are of opinion that it was provided to prevent the ramming vessel from entering too deeply into the rammed enemy. This second ram must not be mistaken for the boarding bridges of the Syracusians, which they provided to fight the vessels of the Athenians. The length of the lower ram may have been some four to six feet.

Between both rams was located the eye, called *ophtalmos*, an aperture of about four inches in diameter intended to allow the passing of the cables with which several vessels were tied together to prevent the passing of the battle line by the enemy's vessels or to obstruct the entrance to some port.

The awning shown in the illustration immediately above the ram should be located near the stern. This was the place for the commander of the vessel, the *trierarch*. This awning was surrounded by a handrail, a kind of ancient stern walk. The stern raised above the awning and was ended by a kind of square fish tail, called *aphlaston*, not by a dolphin tail as shown in the illustration. The *aphlaston* pointed forward. Likewise the stem rose above the gunwale, the part above the *proembolon* being called *stolos* and being ended by a variated ornament called *akrostolion*.

The flag shown above the ram is an anachronism, because the ancient Greeks had no flags for their vessels. The use of stern flags became general only during the Crusades, when the knights embarked in the vessels stowed their lances provided with flags on the stern castle.

The masts are shown in the illustration both of equal height but this seems not to have been the case, nor does it agree with Mediterranean practice. The vessels of the Greeks had a nearly perpendicular mainmast about the middle of the hull, called *histos megas* and a smaller mast inclined forward near the stem—called *histos akateios*. Both masts were provided with backstays. The yards called *keraiai*, were hoisted by a halyard, called *chalinon*, and were fixed to the masts by a parrel, called *agkoina*, formed of two ropes embracing the yard. Furthermore the yards were provided with two braces, called *yperai*, and lifts, called *imantes*. The

mainmast could be folded down and was not always carried on board but was sometimes unshipped before the battle.

The dimensions of the ancient Greek vessels have not yet been settled, but have to be approximated from the distance between two rows of columns in the boat houses between which the vessels had to lie. One may suppose that the dimensions of a triere were about the following:

Length over all	118-131 ft.
Length in the water line	114-127 ft.
Maximum beam	18-21 ft.
Beam at about the water line	11.5-14.6 ft.
Draught	3-5 ft.
Displacement	82-122 tons
Coefficient of fineness	0.60-0.70

The crew of a triere totalled about 200 officers and men, of which about 170 were oarsmen and only about eighteen heavily armed soldiers. This relatively small number is to be explained by the very little room left at the stem and stern for other people than oarsmen. Among the eighteen soldiers were four archers. In case of need during the battle some of the oarsmen reinforced the soldiers.

The speed of a triere under oars was about four or four and a half knots. One of the fastest voyages executed by a triere was the one to bring to Athens the news of the defeat after the battle of Aegospotamos, in 405 B.C. This vessel made on that occasion a mean speed of about five knots. Under sail the speed may have been six knots, but as the hulls were rather shallow and side or center boards were not known sails could be set only with a wind well abaft the beam.

The vessels of the ancient Greeks had two, three, four, or five rows of oarsmen and so had the vessels of the Romans. The respective designations are:

Greek	*Number of rows*	*Latin*
Diere	Two	Bireme
Triere	Three	Trireme
Tetrere	Four	Quadrireme
Pentere	Five	Quinquereme

The triere was the most usual type with the ancient Greeks, and only later on the number of rows of oars was increased.

There have been great controversies as to the seating arrangement of the trieres. Unfortunately it would carry us too far to speak today about this question and I must postpone it for another time.

A Makeshift Destroyer Leader

(See page 40, January, 1928, Proceedings.)

Brockholst Livingston.—One begins to believe that all this discussion of destroyer leaders must cause some of these vessels to be built, or, as Commander Stiles now suggests, some of our existing destroyers to be remodeled into "makeshift destroyer leaders."

At first glance this new suggestion for leaders for our destroyer squadrons appears a reasonable ship. However, does the expense of its remodeling seem justifiable? The latest destroyer was completed in 1923. By existing figures, she will become obsolete in 1938—at the latest. She, therefore, has ten years more of useful life. Others of her type were completed as far back as 1919, or perhaps even further for I have not pursued my figures carefully. Let us grant, for the sake of this paper, that it is proper to choose six of our best and latest destroyers to undergo remodeling as destroyer leaders. The cost certainly would not be large. The result *might* be very good; it certainly would be worth the expense.

Certain points may be brought out in the design discussed here. The doing away with the present wardroom shower and head is a weak point. With the addition of several officers, an additional shower and head would seem necessary. The present C.P.O. compartment for this purpose might be thus utilized in place of mess attendant berthing space. By making the C.P.O. compartment slightly more compact, space could be found for the additional mess attendants.

The space between the office and radio room wherein we find the officers' and crew's hatches—if they will remain in this position with the rearrangement—might well be left open with only a deck above in place of the present awning. This would help to decrease the weight. Short wind and spray shields might be installed here for the companionways are rather wet during a driving rain or rough weather.

The above points are, of course, but incidentals which would be worked out in the detailed designs. They are mentioned only because they came into my mind as I was writing.

A more important matter is the question of the staff assigned to a squadron commander. In his design, Commander Stiles has made provision for five more staterooms

than are installed on the present destroyers. This includes the quarters for the destroyer commander and the squadron commander. Altogether there are:

Squadron commander's cabin..... 1
Ship commander's cabin 1
Single staterooms..... 7
Double staterooms..... 2

or, accommodations for thirteen officers. The present destroyer officer complement is eight. Five berths then remain for the squadron commander and his staff.

I do not know the reason why Commander Stiles has restricted us to four staff officers but he apparently has some good reason.

If we study the officer personnel attached to destroyer squadron commanders' staffs, we find the same lack of uniformity we do with the assignments to all staffs. The following table was prepared to show this:

TABLE 1.
DESTROYER SQUADRON COMMANDERS' STAFFS

	Destroyer Squadron				
	11	12	9	14	Asiatic
Leader:					
Lt. Comdr. (Sqd. Engineer).....	X				X
Lt. Comdr. (Sqd. Gunnery Offr.).....	X	X			X
Lieut. (Sqd. Gunnery Offr.).....		X		X	
Lieut. (Sqd. Engineer Offr.).....			X	X	
Lieut. (Sqd. Radio Offr.).....	X	X	X		
Lieut. (Assistant Sqd. Engineer).....	X	XX[1]	X		
Lieut. (No assignment given).....	XX	X	XXX	XXX	
Lieut. (Sqd. Commun. Offr.).....				X	
Lieut. (Communication Offr.).....				X	
Lieut. (jg) (Radio Offr.)		X			
Lt. Comdr. (Commun. Offr.).....					X
Lt. Comdr. (CC) Matl. Offr.....					X
TOTAL.....	6	7	6	7	4

[1] Assistant squadron engineer and assistant engineer officer—presumably same detail.

The figures, taken from the October, 1927, issue of the *Navy Directory,* prove to us that there is a lack of reason used in these assignments which could well be replaced with some definite plan upon which to base all destroyer squadron staffs and, in fact, all staffs. Commander Stiles has made provision for four staff officers. Is he not basing his design on a seemingly proper reduction in the number of officers assigned to this duty? Why should the twelfth and fourteenth squadrons operate with seven staff officers when the Asiatic squadron gets along with four including a material officer of the construction corps?

One detail must be brought out here. Construction corps officers should not be assigned to the staff but should be on board the tender. In fact, no staff corps officer should be on a squadron commander's staff. With the exception of the Asiatic squadron, none is now so assigned.

What then is the proper staff for the commander of a destroyer squadron? Would not four officers be ample? This allowance would permit the following: lieutenant commander as squadron engineer, lieutenant commander as squadron gunnery officer, lieutenant as squadron radio officer, and lieutenant as aide. The radio officer would also be communication officer. The aide would act as plotting officer in battle.

Instead of the thirty officers now assigned to staff duty with the squadrons, this plan would require twenty.

An item which has been left out in the design submitted by Commander Stiles is the question of saluting guns for the leaders. If they can be worked in, they seem to be warranted. Perhaps a semi-portable landing gun could be made to answer the purpose.

The new design creates a new angle to the destroyer leader controversy. It is one which should be studied and, if possible, made use of principally for the reason Commander Stiles mentions in the conclusion of his discussion. He says: "When we do commence to build new destroyers, they should be modern in every respect, and designed to act together as a homogeneous unit rather than to serve as leaders to obsolescent and deteriorated units." Almost before we could complete destroyer leaders, our present destroyers will be obsolete. Why not take the advice offered us and build homogeneous units—and by unit we mean the squadron? Let our plans include a squadron of destroyers with the leader. In the future we shall not have the immense

programs the last war saw us undertake. When replacements come along, they will consist of a few destroyers each year. Let the leaders be built for the individual destroyers they are destined to lead. Do not build a number of leaders which, as a class, will totally outrank the destroyers. Let us construct a destroyer squadron as we would an individual ship. No one ever heard of building a capital ship and leaving out its conning tower, or of building the tower as a separate unit. Why should a squadron of destroyers, which act as a unit, be constructed without its leader? Let the two be built simultaneously so that both are comparable in every way. Commander Stiles is most certainly right.

The cost of converting one of our *Decatur* class destroyers into a destroyer leader would not be exorbitant. It would permit us to try out the idea which Commander Stiles has given us. Congress would, I am sure, readily appropriate the funds with which to undertake this conversion, for the thought of one hundred and fifty-odd laid-up destroyers is not a pleasant one for the lawmakers of the nation. If we can make use of some of them until the time when they must be replaced, would not those who hold the purse strings be pleased?

The time of conversion would not be great and we should soon be able to tell whether others should follow this transformation. Commander Stiles has brought forth a good idea and we most certainly should act upon it.

A Contribution to Good Will

(See page 182, March, 1928, PROCEEDINGS)

LIEUTENANT COMMANDER THOM WILLIAMSON, JR. (*ChC*) *U.S.N.R.*—I am impressed with the good which may come from a practical following of the suggestions in this article. But we can go a little farther.

Since my resignation from the regular Navy in December, 1919, I have been impressed with the small amount done to broadcast information about the Navy and its objects.

My first parish after I was ordained was in Washington, D.C. In my part of the town, I was about as far from the Navy as though I had lived in the old Indian Territory.

My next parish was in southern Ohio. This is a so-called "dark zone" as regards the Navy, but even so I had heard more Navy talked in the American Legion post than I had heard in my parish in Washington. Also, in that part of the country were many "pacifists," and the Navy was, indeed, "foreign."

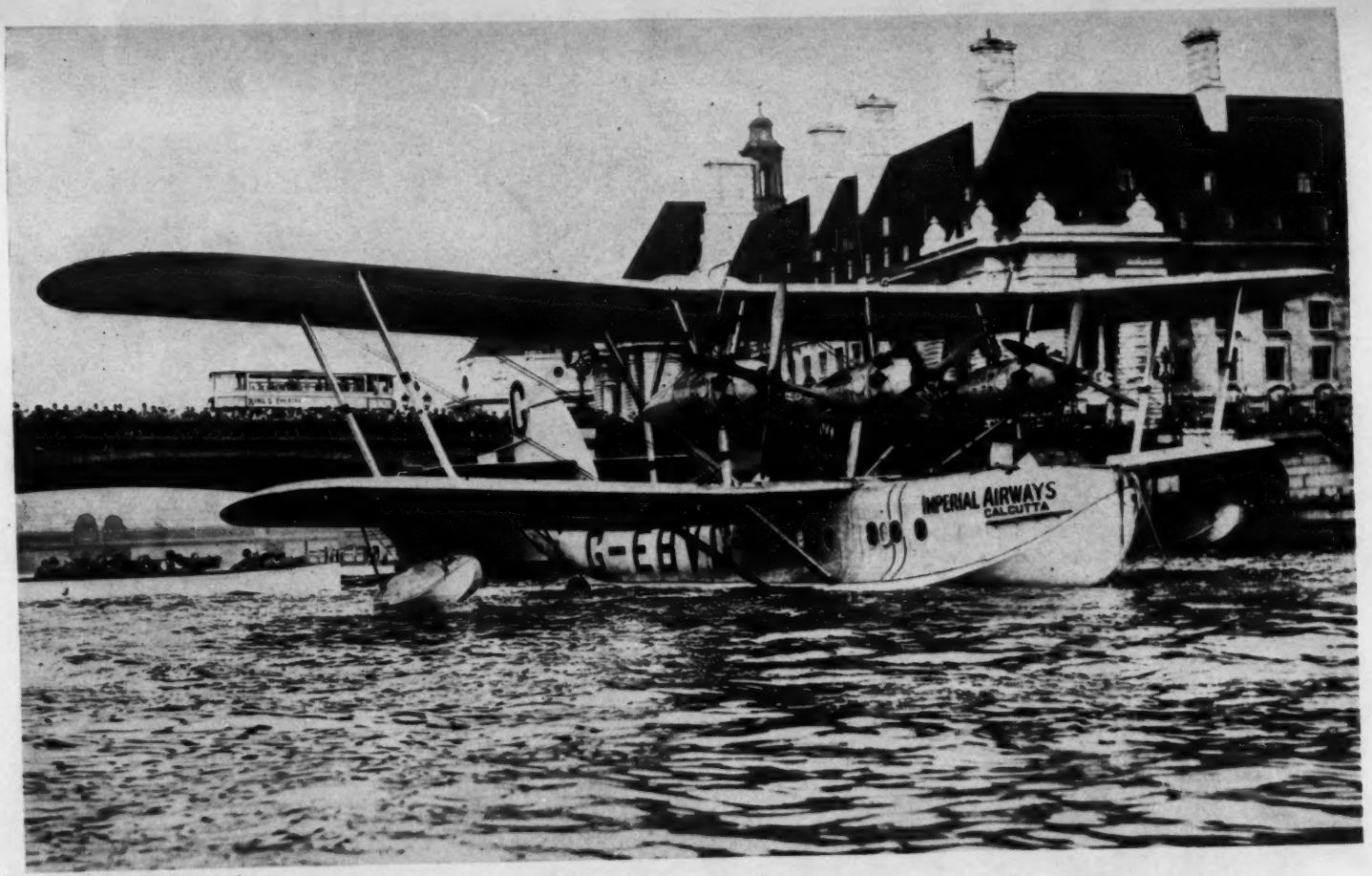
Here in northern Rhode Island we sometimes see a bluejacket on the street, or read in the paper of some young man entering the Navy or Marine Corps. Even so, just now, due to the *S-4* and some other matters, the Navy is not popular, even among many young people.

Lieutenant Ihrig has certainly hit the nail on the head. And may I land another blow.

Some months ago I attended a meeting of some of the clergy of our church. In connection with the propaganda of the Faith the idea (not new) developed that each could help a little in spreading information, and preventing misinformation, by providing religious (church) magazines to our local public libraries. I frequently do this in my town.

Now, we home subscribers to the PROCEEDINGS may supplement the efforts of those who are away from home, by sometimes taking our copies to our local libraries, or clubs, or societies. Not a little good may also be done by having the women in the subscribers' families take copies of the PROCEEDINGS to women's clubs or societies.

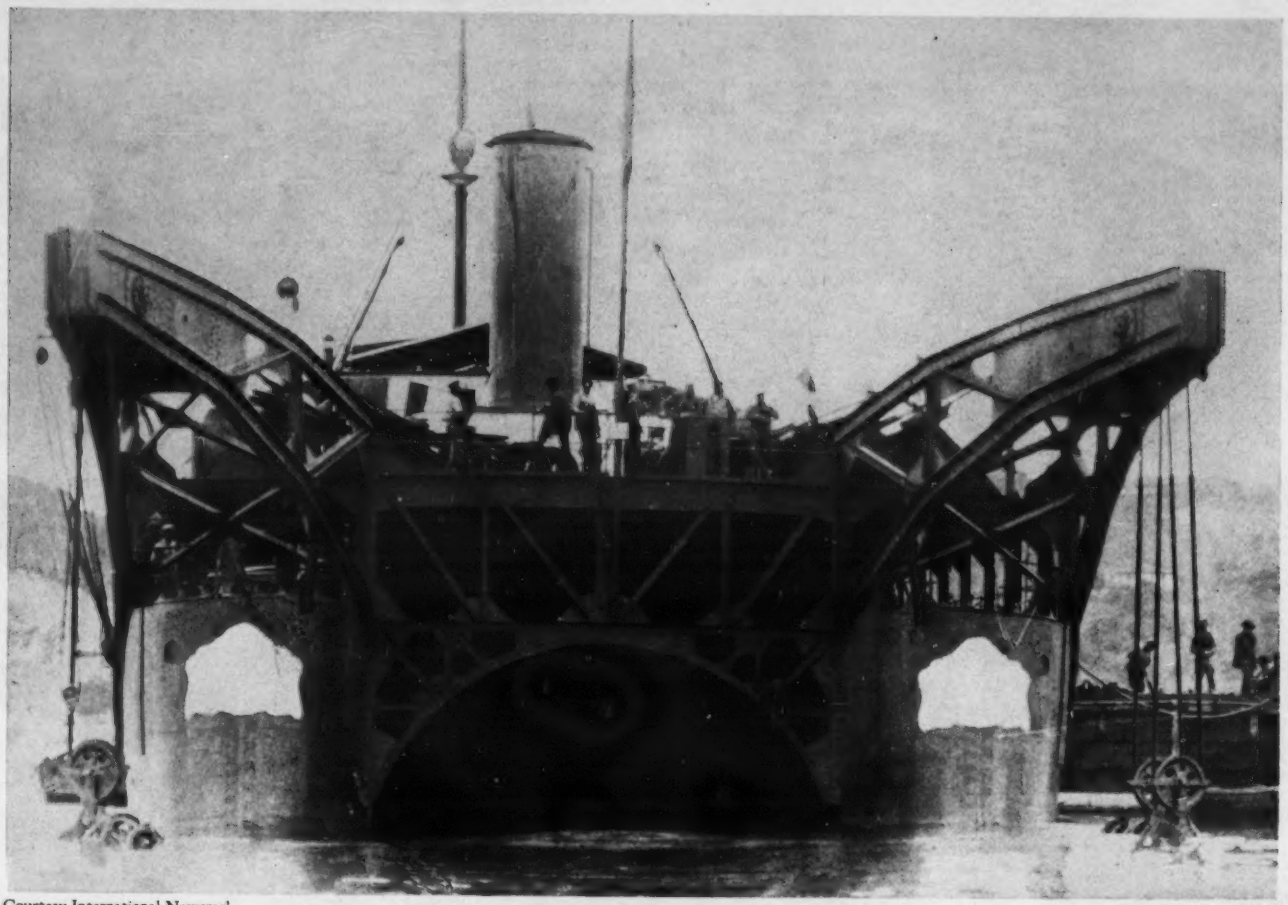
Friends of our Navy do not have to be "militarists"—else I should certainly not be in the naval reserve, or among the subscribers to the PROCEEDINGS. The peacetime work, and the value of the Navy to the cause of peace, are so little known in the country at large that it is worth while to do something to spread knowledge as to this phase of the Navy's work.



Courtesy International Newsreel

GIANT BRITISH FLYING BOAT

Photo shows the giant all-metal *Short Jupiter* flying boat, which is declared to be the finest of its type, as it appeared on the Thames River alongside the houses of Parliament, being inspected by members of the Parliament who are shown in the boat at left. Other sightseers are being taken around the plane for 10 cents a head.



Courtesy International Newsreel

SUBMARINE MOTHER SHIP

Photo shows a submarine mother ship of the type which may be used by the Italian Navy to attempt the raising of Italian submarine *F-44* which was recently rammed by the destroyer *Guiseppe Missori* seven miles off the Island of Briandi and sunk to a depth of 125 feet.

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PROFESSIONAL NOTES

31 JULY TO 31 AUGUST

COMPILED BY
COMMANDER F. W. ROCKWELL, U. S. NAVY
LIEUTENANT COMMANDER A. C. MCFALL, U. S. NAVY
AND
PROFESSOR HENRY BLUESTONE, U. S. NAVAL ACADEMY

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...was recently rammed by the destroyer *Giuseppe Missori* seven miles off the Island of Briandi and sunk to a depth of 125 feet.

GREAT BRITAIN

Recent Naval Construction

The Engineer, August 10.—The month of July witnessed a series of warship launchings which deserve special notice by reason of the novel design of most of the vessels concerned. First in importance was the launch of H.M.S. *Shropshire*, at Beardmore's yard, Dalmuir, on July 5. This ship is the fourth unit of the *London* class, which closely resembles the preceding *Kent* group in general dimensions, but is equipped with more powerful machinery. The *Shropshire* and her sisters are accordingly expected to attain a speed of thirty-two and one-half knots, as against the thirty-one and one-half knots of the *Kent*. The lines of the hull have been fined down by omitting the external bulge, which is a feature of the *Kent*, but it is claimed that underwater protection has not been impaired by this modification. Incidentally, the four *Londons* were the first cruisers of the 10,000-ton class to be designed by Sir W. J. Berry, the present Director of Naval Construction.

On July 17 another cruiser, H.M.S. *York*, was put afloat from the Palmer Shipbuilding Company's yard at Jarrow, the naming ceremony being performed by the Duchess of York. This vessel is the first of the *B* cruisers to take the water. They represent a compromise between the 10,000-ton type, which suffers under the drawback of excessive cost, and the fleet cruisers built under the war programs, which are too small and of too restricted a radius to be of much value for service on the ocean trade routes. The standard displacement of the *York* is slightly over 8000 tons. and it is announced that she will carry six 8-inch guns. We are glad that the Admiralty decided against a 6-inch armament, which had been recommended in some quarters. To armour *B* cruisers with 6-inch guns would have been to render them helpless against the 10,000-ton 8-inch gun ships which they would probably have to encounter in war. Mounting weapons of equal caliber and weight, however, they need not shrink from action with these larger opponents. It is to be hoped that all our future cruisers will be provided with an 8-inch armament unless or until the other naval powers revert to guns of less caliber. The British Government has twice advocated the limitation of cruiser guns to 6-inch, and as this proposal has not found favour abroad, we have no option but to retain the 8-inch weapon in our new ships, despite the reduction in tonnage.

The third vessel to be launched for the British Navy last month was H.M.S. *Medway*, a submarine depôt ship, which went afloat at the Vickers-Armstrong yard, Barrow-in-Furness, on July 19. The *Medway* is the first of four auxiliary ships included in the five-year naval program adopted in July, 1925. She will take the place of the *Maidstone*, which has now been transferred to the disposal list. The displacement of the *Medway* has not been published, but her length between perpendiculars is 545 feet. Accommodation is provided for all the officers and crews of submarines attached to her in addition to her own complement and repair staff. The extensive workshops on board include a foundry, machine shop, plate shop, smithy, torpedo shop, and plumbers' shop, all of which are equipped with the latest equipment. Some notes on the propelling machinery, which consists of two sets of double-acting, two-stroke, internal-combustion engines, built by Vickers-Armstrongs under license from the M.A.N. firm at Nuremberg, have already appeared in our columns. These engines are the first of their type to be manufactured in the British Isles, and at the time when the contract for the *Medway* was booked, they were the largest engines which had been designed by the M.A.N. people. Since then, it was stated at the launch, Mr. Callender, the Vickers-Armstrong engineering director, has seen running in Germany a M.A.N. engine of 12,000 b.h.p. The machinery equipment of the *Medway* constitutes the best evidence of the Admiralty's practical interest in the development of the I.C. system.

On July 18 the Argentine flotilla leader, *Mendoza*, was launched by J. Samuel White and Company, at Cowes. This is the first of three sister vessels ordered from the company by the Argentine Government a year ago, in the teeth of keen competition by continental shipbuilders. The *Mendoza* is 335 feet long over all, 31 feet 9 inches in moulded breadth, and has a displacement of about 1800 tons. She will be driven by two sets of Parsons type single-reduction geared turbines, supplied with steam

THE ARGENTINE DESTROYER-FLOTILLA LEADER *MENDOZA*, IMMEDIATELY AFTER BEING LAUNCHED. (See page 904)

at a pressure of 250 pounds. There are four three-drum, small-tube boilers, which are the largest of their type so far manufactured for marine service. Vickers-Armstrongs are responsible for the armament, which consists of five 4.7-inch guns, one 3-inch, and two 0.40-inch A.A. guns, and six 21-inch torpedo tubes on triple-mountings. While it is satisfactory that a British firm should have secured this important business, it is evident from speeches made after the launch that the contract is not a particularly lucrative one. The completion of these three fine vessels will add greatly to the strength of the Argentine torpedo flotilla, which already includes two modern leaders, also of British design, that were purchased from the Spanish Government last year. Another large foreign naval contract now in hand is that for the six Chilean destroyers, which J. I. Thornycroft and Company, of Southampton, booked over twelve months ago. Four of these vessels are already in the water, the Serrano having been launched in January, the *Orella* in March, the *Riquelme* in May, and the *Hyatt* on July 21. The *Serrano* returned to Southampton at the end of July on completing her speed and endurance trials, the results of which, we are informed, were most satisfactory, the contract conditions having been exceeded. This vessel, an illustration of which was given in our last week's issue, has been built in record time.

A fairly large amount of naval tonnage is now on the stocks in this country, including the 10,000-ton cruisers *Dorsetshire* and *Norfolk*, which are being built in Portsmouth Dockyard and the Fairfield yard at Govan respectively, and the 8,000-ton cruiser *Exeter*, the keel of which was laid at Devonport on August 1. The big repair ship *Resource* is under construction by Vickers-Armstrongs at Barrow, the flotilla leader *Codrington* by Swan, Hunter and Wigham Richardson, and two minesweepers by Hawthorn Leslie. Eight destroyers and ten submarines are also being built by contract, besides two submarines at Chatham. While this list seems an impressive one numerically, the actual sum of tonnage involved is, of course, very far below the average in pre-war years, and it is undoubtedly the fact that naval contracts have ceased to count as a major branch of business to our shipbuilding industry. This notwithstanding, such contracts are welcome enough at the present period of depression, and disappointment has been caused by the Admiralty's announcement that three ships of the 1928 Navy Estimates, which were originally to have been put out to contract are, in fact, to be built in the Royal Dockyards, viz., a submarine depôt ship at Chatham and two sloops at Devonport. No reason has been vouchsafed for this change of plan, but the shipbuilding community is probably right in attributing it to the influence of the Dockyard M.P.'s, who have been noticeably active of late in the interests of their constituents.

While the directors of our heavy industries are second to none in desiring the promotion of peace and goodwill among the nations, it cannot be denied that they are peculiarly, not to say painfully, interested in the movement to effect a further limitation of naval armaments. It has never been possible to measure the full effect of the Washington Naval Treaty on British shipbuilding and kindred trades, but the almost complete cessation of battleship construction over a long term of years, coupled with the reductions made in the cruiser program, have unquestionably dealt these industries a heavy blow. In the normal course of events the Admiralty would probably have been ordering capital ships at the rate of two a year from 1921 to 1930 inclusive, and as each ship would certainly not have been less than 40,000 tons in displacement, the volume of such construction alone would have amounted to 800,000 tons for the ten years in question. Had lighter craft been built in equable proportion, the total output of warships during that period must have been considerably in excess of a million tons.

Owing to the Washington agreement, however, only a tiny percentage of this naval tonnage has been ordered. It is obvious, therefore, that naval limitation is responsible in no small degree for the depression which has afflicted our heavy industries of late years. Should the recent negotiations between the British and French Governments eventuate in a new agreement for the restriction of navies, a further decline in the number of Admiralty contracts must be anticipated. The only consolation left to the shipbuilders is the reflection that their loss is the country's gain, assuming, of course—what many people take leave to doubt—that

any further reduction in the strength of the British Navy would really be in the best interests of this country.

Cruiser Types

Naval and Military Record, August 8.—In view of the insistence of the American delegation to the Geneva Conference of last summer upon 10,000-ton cruisers armed with 8-inch guns it is rather interesting to find Captain H. C. Dinger, of the United States Navy, expressing the view that this type of cruiser is too heavily gunned. In the course of a very clear review of cruiser functions, he shows that the armored type and the heavy fighting type represent mistaken ideas. In this country the armored cruiser finally disappeared in the battle-cruiser. It is true that in the *Aurora* class an attempt was made to produce on armored light cruiser, and these vessels did good service during the war, not indeed because of their armor, but because of their high speed and adequate armament. The experiment was not repeated, whence we must conclude that experience led to the view that armor protection in small cruisers is not worth the weight it demands. The United States still has in service a considerable number of armored cruisers of pre-war days, but, as Captain Dinger says, these are not satisfactory vessels since they are neither one thing nor the other. Probably this expresses what our own Admiralty feel about the 10,000-ton, 8-inch gun cruiser.

Over-gunning, either in the form of a too-heavy weapon or a too-heavy battery, has been a common blunder of cruiser design in the past, more particularly on the part of foreign powers. The late Sir William White perceived this defect, which at that time was most marked in the Italian Navy, and rather went to the other extreme in the *County* class, which were under-gunned for their displacement. In one respect we think the eminent designer was right, and this was in his dislike of the 9 2-inch gun for cruiser armament. It was too big for its purpose in his opinion, and one consequence of adhering to it in the later armored cruiser types was that we reached a displacement of about 14,000 tons, virtually equal to that of contemporary battleships. Captain Dinger points out that one result of giving a 10,000-ton cruiser a heavy battery of 8-inch guns is to curtail her ammunition supply. In our view a stronger objection is the curtailment of radius of action, although obviously this is more important to the British Navy than to any other. The primary consideration in cruiser design should be to get the maximum of sea-keeping endurance. The principle of superiority in combatant qualities must not be too largely imposed at the expense of cruising capacity.

The armored cruiser has been abandoned by all the great naval powers, because, as Captain Dinger says, she is neither one thing nor the other. In the 10,000-ton vessels built or building in this country and the United States, protective weight has been reduced to the barest minimum. On the other hand, aggressive weight has been increased to the maximum. Is this quite logical? A cruiser armed with 8-inch guns, as Mr. Bridgeman put it at Geneva, is an aggressive ship and not merely a defensive and protective cruiser. It has long been held an elementary maxim of naval architecture that an aggressive ship must have the power of resistance as well as the power of striking. She must be able to withstand blows whilst she is getting in her own, otherwise she is likely to be knocked out before her superior muscles can assert themselves. From this point of view the definition of the new 8-inch gun type, "tinclads," invented we believe by Mr. Maurice Prendergast, is justified. The *B* class are being armed with 8-inch guns presumably for the reason that all the great naval powers have adopted this Washington maximum for cruiser armament. In other words, the great naval powers are favoring the contradictory principle of aggressive armaments upon virtually undefended hulls.

The truth is that the development of cruiser armament has outgrown the conception of cruiser functions. Were it not that the Washington Agreement sets a limit, we should have competition lifting its unreasoning head. The British Admiralty would be glad to take as a standard a displacement of somewhere around 7,000 tons and an armament of 6-inch guns for cruiser design, but they can scarcely ignore the heavier armament of all the principal foreign powers. One argument put forward on behalf of the heavily-armed cruiser is that she is better suited to fleet work. What is meant by fleet work to justify this contention? Scouting and screening demand high

speed and rapid fire delivery rather than big shells. If fleet work means taking a hand in the fighting it must presuppose that the unarmored cruiser may employ her salvos against an enemy line. Or are we to assume that in a future general action the cruisers will run a secondary show of their own whilst the battleships are having it out? Such an idea would be a ludicrous distortion of all the accepted conceptions of cruiser functions in fleet actions.

The aggressive cruiser, in fact, is rather a puzzling type. Probably, the term is designed to explain her heavy armament rather than to positively define her rôle. But there is another aspect of the matter. It has been suggested that the capital ship has outlived her functions and that she may be replaced by the cruiser as the premier fighting unit. This idea finds no official sanction in Great Britain, the United States, and Japan. But France and Italy, as far as it is possible to judge have renounced all idea of future capital ship construction. In these circumstances it is intelligible that they should decide to arm their big cruisers as heavily as possible, since they would actually be their aggressive ships. The question then becomes one of whether we must respond to this heavy armament in our own cruisers. Evidently, the Admiralty think we must, since they are giving the *B* cruisers 8-inch guns, although the original idea was to reproduce the *Emerald* design in these vessels. As a result, we are building aggressive cruisers for protective work.

The Admiralty do not conceal that this policy has been imposed upon them and is not a matter of simple choice. As all warships are built in reply to foreign warships, we are bound to regard such important details as gun-powder. France and Italy may really be in a transition stage to an era in which a 10 000-ton cruiser will represent their biggest type of warship. Such a vessel would cease to be a cruiser in the legitimate signification of the term. When the battle cruiser was "evolved" it was not pretended that she was designed to fulfill cruiser functions at all. She was literally an aggressive cruiser for fleet work, a very mobile ship-of-the-line, which might be detached for any episodical enterprise. If economic considerations were of no moment, then the biggest possible cruisers with the heaviest possible armament would be well enough. But since money counts and numbers count we cannot afford displacements and guns which are altogether in excess of functional needs. The trouble is that the great naval powers appear to have abandoned all traditional conception of the rôle of the cruiser, and we are obliged to conform to their progress. It is rather like a chess tournament into which the players insist upon importing quite novel pieces and demanding that the values of the moves shall be adjusted to these.

FRANCE

French Naval Maneuvers

Naval and Military Record, August 15.—This year's French naval maneuvers, which came to an end last Saturday, have been on a somewhat ambitious scale. They were the first held in which the opportunity has been given for the study of combined action by the newest warships of all classes in conjunction with aircraft. Altogether forty new warships took part in the operations, including cruisers of 8,000 tons, torpedo boat destroyers, and submarines. The maneuvers were divided into three phases, the first taking place in the Mediterranean between May 30 and June 2, the second in the Atlantic from June 11 to 17 and the third in the Atlantic and the Mediterranean between July 27 and August 4.

The first stage consisted of a scheme in which cruisers, destroyers, and submarines were engaged, the cruisers advancing through the Gulf of Lyons and being attacked by destroyers between Sardinia and the Balearic Islands, the phase concluding with a successful attack by submarines in the neighborhood of the Balearic Isles. Aircraft were employed in the second phase, no fewer than eight squadrons of seaplanes being engaged. The main attack was in the region between Lorient and St. Nazaire. The naval authorities, says *La Revue Nautique,* were very pleased with the work of the aircraft which is described as particularly brilliant. They discovered the "enemy" in good time, and made their many attacks in excellent style. Of the third phase details have not transpired, but with regard to the others many new problems were found and solved, not only with regard to tactics but also in the utilization of aircraft to the best advantage, and in the use of smoke curtains.

UNITED STATES

A Subsea Breathing Mask

Washington *Post*, August 27.—The successful demonstration of a compact device for enabling men to breathe while struggling to the surface from a submerged submarine is encouraging evidence of progress. By means of a bag of oxygen attached to the mouth two men of the Navy demonstrated that they could rise to the surface from a depth of 110 feet. They were lowered to that depth in a diving lock, from which they stepped into the open water. A life line to which a cork buoy was attached was released, thus furnishing a means of climbing to the surface. The men made their way upward, hand over hand, and felt no ill effects from their experience, although it had been expected that the water pressure at the greatest depth reached would cause divers' "bends."

The bag of oxygen and the accompanying mask can be made to weigh only 2 pounds. Equipped with this and with a life line properly buoyed the crew of a submarine if they could emerge from the vessel could reach the surface from a depth of 110 feet. This much is a certainty. Experiments are now to be made to determine whether men can go deeper, say to 200 feet, and save themselves by using this device. The experiments are dangerous, but volunteers stand ready, as they always do in the Navy.

Naturally, this oxygen mask would be useless to men trapped within a submarine. But the proved practicability of the apparatus may lead to structural changes in submarines, whereby in case of accident the crew can take to the water and individually work to the surface.

Igloo Magazines

Washington *Post*, August 23.—The Navy recently adopted a new type of construction for high explosive magazines. Experiments, which were tried out at the proving grounds at Indianhead, Maryland, convinced naval officers that this new type of magazine is by far the safest yet developed.

The new type, which is called an "igloo" magazine because of its similarity in shape and size to the Eskimo home, is fireproof and is constructed entirely of reënforced concrete. It is a rather small structure, with a low dome. The Bureau of Ordnance announced that the experiments were highly satisfactory and that the new ammunition depots at Hawthorne, Nevada, and in the Philippine and Hawaiian Islands would be of this improved type.

In order to test the resistance of the igloo, the naval powder factory detonated 3,300 pounds of TNT in one that was surrounded by three others, partly exposed, also containing high explosives. The test proved that this type of magazine eliminates all possibility of sympathetic explosions, as the three magazines, which were not more than 25 feet distant, did not explode, although two of them collapsed, due to the intense pressure of the detonation. The Navy will choose sites in the sides of hills whenever possible, so that the igloo may be covered with earth, thus lessening the danger of sympathetic explosions.

The igloo magazine came as a result of the explosion at Lake Denmark, New Jersey, which occurred July 10, 1926, killing 21 people, wrecking 80 buildings and causing a property destruction of about $85,000,000. The explosion was caused by a bolt of lightning striking a powder magazine.

The igloo type of construction is very expensive compared to the old type of magazines, but in view of the fact that the life and property loss was so great at the Lake Denmark explosion the increased expense of this safe type of magazine should not be considered. If there is any place where every precaution for safety should be provided it is at an ammunition depot.

Aërological Survey of Atlantic

Washington *Post*, August 28.—Balloons will trail from the Shipping Board liner *America* across the Atlantic on her voyage from New York to Cherbourg and return, beginning tomorrow night.

Three junior naval officers, students in the Navy's post-graduate aërological course, will make upper air observations by the use of small pilot balloons in order better to learn the vagaries of the elements over the trans-Atlantic air lanes. The balloons are to be released and followed by theodolites, horizon measuring compasses. The data gathered will be used by the Navy and Weather Bureau.

Research Program of Byrd's Expedition

New York *Times*, August 22.—Announcement was made yesterday at the expedition headquarters of part of the scientific program. The most important function of the expedition, it was said, will be geographical exploration to be carried out largely by airplanes, but there are a number of wide fields of investigation for the scientists of the party.

The following elaborate program of research has been laid out:

Potential gradient of the atmosphere (one year or more record with equipment furnished by the Carnegie Institute).

Auroral observations.

Earth radiation: (a) Thermometric records.

Sky radiation.

Radio activity of snow, ice, and such geological specimens as may be found.

Penetrating radiation.

Ionic content of the atmosphere.

Conductivity of the atmosphere.

Glaciology: (a) Crystalographic structure of the ice.

Glacial velocity determinations.

Correlation of atmospheric humidity with atmospheric electricity.

Gravimetric determinations.

Oceanography and hydrography: (a) Plankton collection (Buffalo museum); (b) marine micro-organic photo-microscopy; (c) depth, temperature, salinity, and color of ocean bottom where possible.

Magnetic observations: (a) One year or more records total and horizontal intensity and declination (Carnegie Institute).

Dip circle determination of F. H. and D. from as many field stations as possible.

William G. Haines, forty-one, the meteorologist of the expedition, who is on the staff of the United States Weather Bureau in Washington, will make a special study of temperatures, wind velocities, humidity, and other weather conditions. Mr. Haines will assemble and study barometric records.

Malcolm P. Hanson, of the Naval Research Laboratory, and Lloyd Berkner, radio engineer of the Bureau of Standards, in addition to their work of keeping up the communications, have the following subjects to interest them:

Directivity of static; fading of radio signals; Kennelly-Heaviside layer determinations; echo signaling, and circum-terrestrial measurements.

Lawrence H. Gould, professor of geology at the University of Michigan, and his assistant, J. S. O'Brien, have laid out the following program:

Detailed mapping of the main base and its environs.

Exploration and mapping of as much of the coastland of King Edward VII Land as is possible by whatever means of transportation available.

Mapping and study of mountains with reference to structure, trend, materials, etc., with a view to determining any possible relationships to those of New Zealand or the Andes of South America.

Collecting of rock specimens *in situ*, both for later petrographic study and for study by the geophysical laboratory at Washington.

Exhaustive search for fossils either from rocks *in situ* or from the glacial drift—these will indicate what the past geological history and climate of Antarctica have been.

Mapping of any new routes or places visited by members of the expedition.

Study of glaciers from the geological viewpoint—especially by way of comparison and contrast with those studied by the geologist (Gould) in Greenland.

Cooperation in every way desired with the aërial photographic surveys.

Collection of natural history specimens that can be preserved by salting to be later studied and mounted.

MERCHANT MARINE

Merchant Marine Reserve

Washington *Post*, August 18.—With the report of the board constituted by the Navy in July to receive and pass upon applications for commissions in the merchant marine and approval of its findings by Admiral Charles F. Hughes, Acting Secretary of the Navy, the new reserve service has come into being. Nearly 7,500 commissions have been awarded to officers and seamen. A trained merchant marine reserve answering to that of the naval reserve is thus provided against a time of war. Merchant ships may be readily converted into auxiliary ships for war service.

It is regarded as of particular value that most of the men who have enlisted in the marine reserve have seen naval service and know its needs and discipline. Some of the men were in the reserve during the war. The rules governing the reserve provide that an "approval list" shall be constituted of men serving upon ships of a certain designated tonnage and over. These make up the officers' personnel of the class of the reserve.

The "continuous service" provision, which insures that those passing from the Navy to the marine service shall, under specified conditions, continue in all the rights and benefits pertaining to their status in the Navy

and otherwise making it easy, without loss, to pass from the one service to the other, not only gives insurance to the men, but also guarantees that men of the established naval arm may readily transfer to the marine reserve class. While this may cause some loss to the Navy, it is believed that the resulting good to the associated service will fully justify any sacrifice in that direction.

Nothing could be more enlightened than to place the seal of preparedness upon the merchant marine and to provide that it shall constitute from the off-start a potential naval reserve for the needs of the country in war emergency. The morale of the men in the reserve will be benefited and a ground of common interest will be established between the men of that service and those of the Navy.

Ocean Liners

The Engineer, August 10.—Work has been begun on the new Atlantic liner which the White Star Company ordered recently from Harland and Wolff, of Belfast. This vessel, the impending construction of which was foreshadowed in *The Engineer* several months ago, will have a tonnage greater than that of any existing ship. Although her exact dimensions have not yet been disclosed, it is known that her gross tonnage will be at least 60,000 and her length about 1,000 feet. The *Majestic*, the largest ship now afloat, is of 56,551 tons gross, and has a length of 956 feet over all. Her displacement, which is generally accepted as a truer indication of size than gross tonnage, is 64,000 tons, as compared with the 63,060 tons of the *Leviathan*, which is often advertised by her owners, the United States Shipping Board, as "the largest ship in the world." The point as to which is the larger ship is not, however, really in dispute, since the designer of both vessels, Herr Foerster, of the Blohm and Voss firm, has publicly stated that two extra frames were worked into the *Majestic* amidships in order to make her the greatest ship ever built.

It will be observed that the new White Star liner now on the stocks at Belfast is classified, not as a "super-*Majestic*," but as a "super-*Olympic*." This appears to indicate that her general design has been developed out of the British-built prototype rather than from the German vessel. There can be no question as to the soundness of this policy. While we yield to none in appreciation of the work of German shipbuilders, we are nevertheless convinced that British ships taken as a whole, are superior to all others in both design and construction. Nor is this mere national prejudice. Apart from the high standard of workmanship which is so characteristic of our leading shipyards, British ships embody a fund of experience which is the unique possession of our naval architects and builders. This applies to every class of vessel, but particularly to the ocean liner, the special functions of which confront the designer with many difficulties. The most essential features of such a vessel are safety, comfort, and absolute reliability in the engine-room. Safety demands the most meticulous calculations as to stability and seaworthiness, combined with maximum strength of structure. The element of risk must be reduced to vanishing point, "safety first" being the guiding principle of passenger ship construction. When a very high speed is specified the problem becomes still more complicated, since a form of hull suitable for great speed may lack those qualities of steadiness and dryness which are regarded as indispensable in a liner. This problem, however, was satisfactorily solved as long ago as 1906, when the *Mauretania* and the *Lusitania* were built. In these magnificent ships high speed was combined with excellent sea-going qualities. Although nearly a quarter of a century has passed since her plans were drafted, and twenty-one years have elapsed since she sailed on her maiden voyage, the *Mauretania* is still in regular service. The annals of steam navigation afford no parallel to the career of this grand old veteran, which has recently astounded the world by setting up a new record for the trans-Atlantic crossing. She arrived at New York from Cherbourg at 4:26 P.M. on July 19, having made the passage in five days, three hours and seventeen minutes, thus beating her previous world's record, made in August, 1924, by three minutes. Moreover, on her latest passage she twice eclipsed her own record for the best day's steaming on this route, covering 654 miles from noon, Monday, to noon, Tuesday, and 663 miles in the succeeding twenty-four hours, at average speeds of 26.16 and 26.46 knots respectively. We venture to say that, had any foreign ship accomplished such a

feat, all the resources of publicity would have been employed to broadcast the fact throughout the world. As it is, however, the exploits of the *Mauretania* cannot fail to enhance the prestige of British shipbuilding and marine engineering. It would appear that no decision has yet been reached in regard to the type of propelling machinery for the new White Star vessel. As Lord Kylsant, the chairman of the company, has great faith in the internal combustion engine, and as Harland and Wolff, the builders of the new vessel have already constructed several of the largest and most successful motor liners, it has been widely assumed that oil engines will be installed in the super-*Olympic*. We have, however, reason for believing that steam turbines will be selected. If the new ship is to be as fast as the twenty-five knot *Majestic*—and it is doubtful whether the company would accept a lower speed—her machinery must develop at least 70,000 h.p. The largest set of marine oil engines so far built has, we understand, a capacity of 25,000 b.h.p. To construct a plant of almost thrice this capacity would therefore be a very formidable undertaking, and one on which the most enterprising shipowner might well hesitate to embark. Not only would the first cost greatly exceed that of turbine machinery of corresponding power, but the building of an oil engine plant of such magnitude would be, in effect, a bold, not to say hazardous, experiment, which the White Star management may decide against as being inadmissible in the circumstances. It should not be forgotten that the same company has already under construction at Belfast a motor liner of some 26,000 tons, which is therefore the largest British motor ship laid down up to the present. The performances of this vessel in service will doubtless influence the policy of the company with regard to the machinery equipment of its future vessels. Certain commentators have taken it for granted that the 60,000-ton leviathan will not be particularly fast, because hitherto the White Star Line has built ships more remarkable for comfort than for speed. But, since the two qualities are not incompatible, the "super-*Olympic*" may prove, perhaps, to be speedier than any vessel now afloat or under construction, not excepting the two Norddeutscher-Lloyd vessels, which are designed for twenty-six and one-half knots. Meanwhile the Cunard Company is understood to have ready the plans of a ship which will be in all respect a worthy successor to the *Mauretania*. In this case very high speed is rumored to be an outstanding feature of the design. Alike for reasons of sentiment and business, we trust that these two great British liner companies may put afloat, in the not too distant future, vessels which will ensure the retention by this country of the blue ribbon of the ocean, while upholding the traditions of safety, comfort, and reliability to which British liners owe their marked popularity with the traveling public. The preëminence of Great Britain in this branch of shipping is revealed by the new volumes of Lloyd's Register, which show that 57.7 per cent of the existing liner fleet—i.e., vessels of 15,000 tons and upwards—is British owned.

Regarded purely as a commercial proposition, it may be doubted whether the huge liner of great speed is a complete success. According to an unofficial estimate, the "super-*Olympic*" will cost about £5,000,000 to build and equip. The cost of operating her will depend mainly on her sea speed. Every additional knot, nay, every additional fraction of a knot, means a disproportionate increase in the fuel consumption. We have no means of estimating the fuel bill of a 60,000-ton ship on a passage from Southampton to New York at a speed of, say, 28 knots, but at the current price of bunker oil the figure would certainly be a formidable one. When to this heavy item is added the cost of victualing the ship on the lavish and luxurious scale now demanded by the trans-Atlantic passenger, salaries and wages, port and harbor dues, and numerous other charges inseparable from the operation of a big liner, we imagine that the margin of profit left over, even with a full passenger list, would be very narrow indeed. It has, in fact, been often stated, and never denied, that our largest liners are actually run at a loss. Without being able to verify this we are none the less convinced that the ordering of such vessels as the "super-*Olympic*" is not directly inspired by the hope of earning dividends. On the other hand, indirect benefit accrues to a company which has the distinction of owning ships of world-wide repute, so that the possession of these costly vessels may bring other and more lucrative business to the owners. When the fleets of

our principal liner companies are examined they will be found to comprise, in the main, vessels of moderate speed which are comparatively economical to run and which probably earn a substantial profit on each voyage with a normal quota of passengers and cargo. It is to vessels of this class, rather than to the high-speed liner, that our great shipowning firms look for their dividends. At the same time, while there is commonly supposed to be no room for patriotism in business, we do not doubt that the desire to maintain the supremacy of the British merchant navy is responsible, in some measure, for the building of a ship such as the "super-*Olympic*," the construction of which it might be difficult to justify on the grounds of business alone.

What Are We Going To Do About Liner Tonnage?

Marine Journal, August 1.—Now that we have tacitly admitted that the cargo boat owners have a legitimate grievance and that something will have to be done about it, suppose we turn to the matter of liner tonnage. Unless our information is hopelessly out of date, we find only one lonesome ship flying the American emblem that falls in this class—the *Leviathan*. In other words, we are trying to operate an American line in competition with the great Cunarders and ships of the White Star line with one entry. There are, of course, several other excellent ships. The reconditioned *America* is one of the best of her class on the western ocean and the same may be said for the *President Washington;* and then we have a ship or so of the *President Harding* type. But the only legitimate liner under the American flag is the *Leviathan*. Three of these ships are ex-German liners.

Now what is happening abroad? We will soon know to our sorrow if any reliance can be placed in news dispatches from British and German sources. From London comes the news that work has been started in the Harlan and Wolff shipyards in Belfast on a super-*Olympic* which will be larger than either the *Leviathan* or the *Majestic*. This ship, it is reported, will not only be the largest ship afloat when she is completed, and the last word in ocean comfort, but she will constitute England's first great bid since the war to retain her western ocean supremacy. This great liner will operate in the White Star fleet and will have cost her owners $35,000,000 when she goes into service in December, 1931. This vessel will displace 70,000 tons—over 6,000 more than the *Majestic* and 10,000 more than the *Leviathan* and she will be 1,000 feet long and 100 feet beam. This will make her 56 feet longer than the *Leviathan*. The super-*Olympic* will make twenty-five knots and will surpass the famous *Mauretania*, which has held the blue ribbon for years. The new liner will be propelled by single-reduction steam turbines working at high pressures, and this, in spite of the fact that Lord Kylsant, head of the White Star Line, is a great booster for the internal combustion engine. Then we have rumors of a great ship to be laid down for the Cunard Line—depend upon it, this line will not be outdone—and this ship may prove to be a super-*Mauretania*.

Meanwhile, ambitious plans are brewing on the Continent. The Compagnie Transatlantique contemplates building a 50,000-ton liner capable of developing a speed of thirty knots and in Germany the new *Bremen* and *Europa* are under construction—ships of 30,696 tons—which will have a speed of twenty-seven knots.

And what are we doing to meet all this? Nothing! True, Mr. Lawrence R. Wilder has been advocating the construction of the 1,000-foot Blue Ribbon liners though little enough is heard about his plans just now; but other than this there is no genuine, concerted movement to place ships of this type on the ocean under the American flag.

What will this neglect mean? Only one thing. It will mean that we will lose a great opportunity to get a share of the profitable passenger business that originates on our own shores.

ENGINEERING AND RADIO

Mechanical Atomizing Oil Burner

Power, August 14.—The ability to atomize properly fuel oil of 14° to 16° Baumé, at a temperature of as low as 100°F. and to handle the heaviest oil at 130°F. are features of the fuel-oil burning equipment put out by Trowbridge and Schellens, 6 Beacon Street, Boston, Massachusetts.

The burner (see Fig. 1) carries inside its nozzle a cone-shaped cup mounted on ball

bearings with its axis horizontal and its open end protruding slightly beyond the nozzle. The cup is made to spin rapidly by an air turbine that is mounted adjacent to it. Lubrication of the bearings is by oil rings dipping into a reservoir in the rear of the burner casing.

FIG. 1—BURNER WITH AIR AND OIL CONNECTIONS

Oil passes through a central spindle which protrudes through a hole in the closed end of the cup. It drips into the cup, is spread out in a thin film on the inside surface of the cup by centrifugal force, and is thrown off at the open periphery in the form of a fine mist. Air at a low pressure exhausted from the turbine passes out through the annular space between the cup and nozzle, picks up the finely divided oil and carries it into the furnace.

The air stream surrounding the cup keeps the oil film cool while the burner is in operation. However, when it is desired to shut the burner off and to close off its air supply, the gun or burner must be withdrawn from the radiant heat zone of the furnace in order to prevent carbonization of the oil film. The removal of the burner is accomplished by pulling the handle *A* back and swinging the gun away from the furnace on the two pivoted links which form the gun supports. The forward link, which forms a conduit for carrying the air to the gun, is provided with a register at its lower end, which closes off the air whenever the gun is withdrawn.

The burner base is arranged either to bolt to the furnace front or to be mounted on a concrete foundation and will carry either one or two guns hanging on either or both sides of the air connection mounted on it, respectively. Secondary air for combustion is preferably admitted through an adjustable slot in the boiler front below the gun or through checker-work in the floor of the furnace.

The combined motor-driven fan and pump shown in Fig. 2, furnishes air and oil to the burner. The fan is of the centrifugal type and delivers air at 6 to 16 oz. per sq. in. pressure depending on the amount of oil to be burned per burner. The oil pump is of the gear type and is driven through a worm and gear on the fan-shaft. The oil pressure varies with viscosity of the oil, size and length of pipe, etc., and is usually below 35 lb. per sq. in.

Two sizes of fan and pump sets and one size of burner are at present available. No. 1 fan set has a capacity, with a single burner, of 4 to 20 gal. per hour, and with a double burner, 7 to 35 gal. per hour. The air pressure in inches of water required is 10 to 12. The corresponding figures for the No. 2 set are, 5 to 25 gal., 9 to 45 gal., and 18 to 21 in. respectively.

These ratings are based on a motor speed of 3,500 r.p.m., and 14° to 16° Baumé oil that is heated to 130°F.

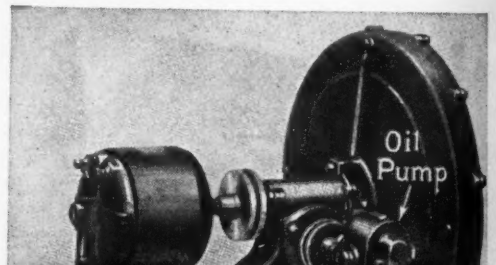


FIG. 2.—FAN AND OIL PUMP SET

Other advantages pointed out by the manufacturer are small power requirements, steady and practically noiseless flame, and ability to carry a small flame without danger of going out.

New Radio Beacon Stations

Washington *Post*, August 26.—The installation of wireless beacon stations at suitable places around the coasts of the British Isles is proceeding rapidly. Six stations have already been erected and are now in operation, and seven more have been ordered. Among those stations now in operation, the Mersey Bar, Coningbeg and Spurn are on lightships, while those at Skerries, Round Island and Casquets are on land.

The next seven stations to be erected, and for which apparatus is now being constructed, are at Start Point, Lundy Island, Sule Skerry, Dungeness, South Bishops, Cromer, and Kinnaird Head. Beachon transmitters are projected also for Tory Island and Mizen Head.

Each Beacon transmitter has a distinctive call signal sent at a speed which enables it to be identified even by inexperienced and unskilled listeners, and as they work on a specially allotted wave length they are generally free from interference from other services. They are therefore aids to navigators in any weather conditions and can be used for bearings by skilled operators with direction finders or by navigators unskilled in wireless work using a bearing indicator.

In the meantime, the United States, which is far ahead of the other countries of the world in the matter of protecting its coasts with radio beacons and fog signals, is now experimenting with a semi-automatic beacon at St. John's River Lighthouse, Florida and the first of this type to be installed in this country.

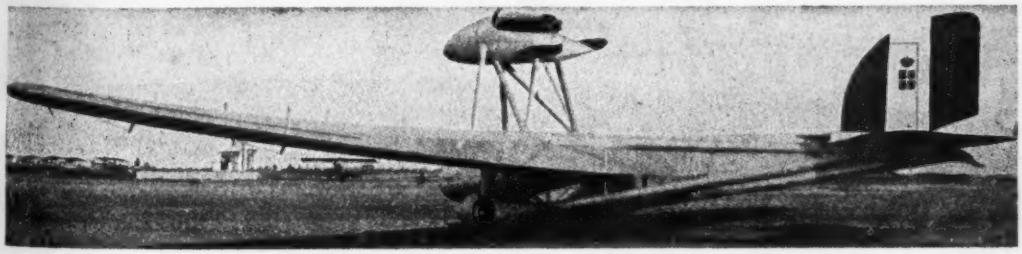
The apparatus consists of the standard 200-watt radio-beacon transmitters, for which power is furnished by two automatic engine-generator units. The entire equipment is controlled by a special clock. The keeper's attention is required only when it is necessary to operate the apparatus during thick and foggy weather.

AVIATION

Endurance and Distance Records of the "Savoia-Marchetti S-64"

Aëro Digest.—The unusual features of design of the Savoia-Marchetti *S-64* are an interesting departure from standard landplane design practice, approaching more closely a combination of sailplane and flying boat arrangement. A study of the available data on the *S-64* reveals several distinctly interesting and advantageous points in its design and while not entering into a detailed discussion of practicability or future possibilities of a plane of this nature, a few comments on the aërodynamic and structural characteristics of the Savoia *S-64* will be made.

The statement by the designer, Mr. Marchetti, that the plane was purposely built for duration and range record strictly defines the purpose of the plane and indicates directly that the greatest proportion of the useful load will be contributed by fuel. Practically all of the successful competitors of the Savoia *S-64*, particularly here in the United States, were externally braced monoplanes with extra-big cabins to house the large amounts of fuel required by flights of this nature. While this may be a practical way to design an airplane with a view to converting it into a passenger-carrying craft, it is certainly not an efficient way to carry fuel and if the plane is purposely designed to attain maximum duration and distance it is only logical to store the fuel in a thick cantilever wing, reducing the size of the cabin to the minimum required by the comfort of the crew. This feature is one of the distinct aërodynamic advantages of the Savoia *S-64*.



THE SAVOIA-MARCHETTI MONOPLANE WHICH WAS FLOWN FROM ITALY TO BRAZIL

Since the amount of load usually carried in flights of this nature is abnormally large, the storing of the fuel in the wing brings forth the structural advantages of this arrangement; instead of a high concentrated load in the fuselage the masses are distributed along the span and so reduce the structural weight of the wing and simplify and lighten the weight of the remaining structure. Other features of Mr. Marchetti's design are probably partly suggested by his flying boat experience but even they seem to have several advantageous features. Placing the engine nacelle high above the wing improves the visibility of the pilots located in the leading edge of the central portion of the wing. This arrangement also permits the employment of considerably shorter landing gear members with a consequent reduction of their weight and resistance, while trussed booms for the tail support do away with the large fuselage which is otherwise necessary.

THE SAVOIA-MARCHETTI S-64 HAS A FLYING RANGE OF 7,050 MILES

The successful outcome of both the endurance and distance flights of the *S-64* is a tangible proof of its characteristics and a practical demonstration of its performance possibilities.

The following information on the *S-64* is a partial translation of an article prepared by the designer of the plane and submitted for publication in *Aëro Digest*. Of course our comments on the performances and structure are based upon this information and the assumption of their accuracy.

The technical significance of the endurance record recently made by the Italian Savoia-Marchetti monoplane lies in its demonstration of the maximum non-stop distance the airplane is capable of covering. Distance and duration records are, however, strictly distinct because of dissimilar conditions under which they take place. If, however, the equipment of the plane, loading conditions, etc., are identical, one record bears a definite relation to the other and an endurance record is the first logical step in attempting a maximum non-stop distance flight.

In the case of an endurance flight, the craft is flown at a very low speed because speed requires power and in order to stay in the air the maximum possible time, the pilot must vary his speed with the natural decrease of the weight of the plane, flying at angles of attack corresponding substantially to the minimum propeller thrust. For the case of maximum range the flight must be made at angles of attack corresponding to minimum consumption per mile, but in actual practice, the flight is made at slightly higher speeds.

To attain the maximum performance the conditions of flight are studied theoretically beforehand and the pilot adheres as closely as possible to a predetermined schedule, making use of special equipment and instruments.

The Savoia-Marchetti *S-64* is a single-engined cantilever monoplane similar in many respects to the Savoia Santa Maria *S-55* of de Pinedo fame. It is also designed by Mr. Marchetti, the designer of both airplanes used by de Pinedo in his famous flight. With the exception of the fact that the *S-64* is a land plane, its similarity in design to the *S-55* can be traced to a cantilever wing structure with an engine nacelle, supported high above it in a flying boat fashion, a short fuselage and tail surfaces supported by two trussed booms or outriggers.

The *S-64* is another characteristic example of the original ideas of Mr. Marchetti and their practicability is amply indicated by the two recent exploits of Ferrarin and Del Prete.

The *S-64* was expressly designed for

maximum endurance and distance records and represents in its detail minute researches for maximum aërodynamic fineness and optimum structural arrangements. An indication of its superior aërodynamic design can be gathered from the fact that the maximum L/D of the *S-64* is 15 with radiator exposed and 16 with the radiator housed. This high aërodynamic fineness is an achievement worthy of high commendation. A thorough study of the structure resulted in an extremely low value of the ratio of the weight empty to the gross flying weight (equal to 0.34) another indication of its superior characteristics.

The cantilever wing of the *S-64* is of three-beam construction covered completely with plywood. The wing profile is tapered from medium thickness at the tips to a thick section at the roots. The interior wing volume is used to house 27 fuel tanks which take up three-quarters of the entire wing span. The piping system permits selection of the flow from the various fuel tanks to take care of any stoppage or leakage and also to correct conditions of balance of the airplane.

The cabin for the crew is located inside the wing in the center and its top projection is well streamlined to minimize the resistance. In addition to pilot's quarters there is a place where the pilot can sleep. The equipment is complete and all the instruments are duplicated for safety and convenience. The instruments include the following:

Three compasses, one magnetic, one gyroscopic, and one of the earth inductor type.

Radio set with dynamo and batteries with a radius of about seven hundred miles.

Heating and illuminating systems with a separate dynamo.

An artificial horizon with a separate dynamo.

Gyroscopic indicators of trim.

A powerful landing light with batteries and accumulators.

This elaborate equipment minimizes considerably the dangers of a long non-stop flight and places it on the basis of a sound technical enterprise.

SPECIFICATIONS

Wing span	70.5 feet
Length over all	29.5 feet
Height over all	12.1 feet
Wing area	646 square feet
Weight empty	5,290 pounds
Useful load (maximum)	10,120 pounds
Ratio of weight empty to gross flying weight	0.34
Gross flying weight	15,410 pounds
Fuel capacity	1,720 gallons
Oil capacity	53 gallons
Load factor from maximum loading condition	4.5
L/D maximum	15
Maximum speed (medium loading)	146 miles per hour
Maximum range	7,050 miles
Horsepower—Fiat A22	500 h.p.
Horsepower loading	30.9 pounds per h.p.
Wing loading	23.8 pounds per sq. ft.

New Universal Hot Spot

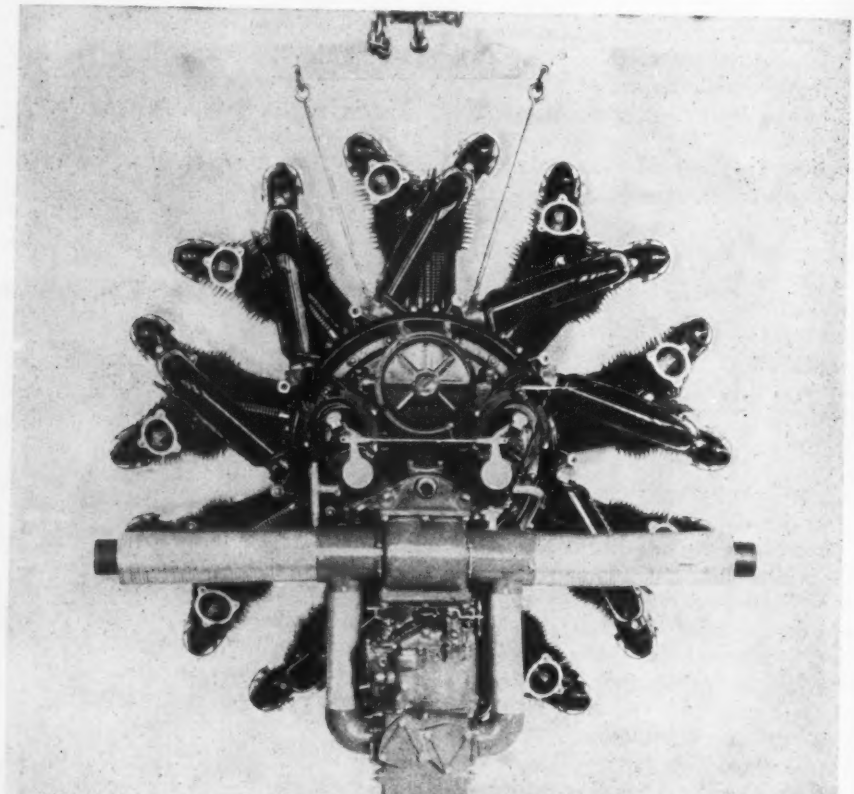
The Bee-Hive.—We have recently put in production, after extensive test and development work, an improvement on the Pratt and Whitney Hot Spot as originally supplied on *Wasp* and *Hornet* engines. The Hot Spot has proved its principle correct, not only as demonstrated in commercial use, but also by some very careful comparative tests made by the Bureau of Aëronautics of the Navy through the Naval Air Station of Anacostia.

The improved Hot Spot involves a change in the construction of the Hot Spot unit itself as well as additional improvements to care for extreme conditions. In the previous type of Hot Spot the exhaust gas was passed around the two vertical pipes which formed the continuation of the two barrels of the carburetor. This old unit was made of welded sheet steel with an asbestos and stamped dural cover. The latest type unit is an aluminum casting with the exhaust pipe passing directly through the middle of the mixture stream. The crosspipe cast integral with the Hot Spot box is surrounded by aluminum finning and lined with steel tubing. Thus in the new assembly the mixture passes around the heated pipe instead of going through passages heated from the outside. This new arrangement gives the maximum heat transfer in the available time.

AIR IS PREHEATED

In addition to this, complete equipment is provided for preheating the air, thus eliminating the possibility of ice formation

in the carburetor and at the same time taking care of the peculiar conditions existing when flying in snowstorms and fog. The preheating arrangement serves two purposes. It preheats, and also ventilates the exhaust pipes under the cowling. As it is, the exhaust pipes passing under the cowling are completely enclosed by an amply large sleeve of flexible dural tubing. This sleeve



THE NEW UNIVERSAL HOT SPOT

projects slightly into the slipstream which forces the hot air around the exhaust pipes down through smaller pipes to the preheater below the carburetor. The intensity of the preheating is regulated by a damper in the air scoop.

An additional advantage is that when the preheated air is in use, the air intake is from the side of the ship, thus eliminating the trouble sometimes encountered with bottom air intakes in emergency landings on snow-covered fields.

Two-Valve Control

Control of the combination is obtained by means of two valves. One of these determines the amount of exhaust gas which passes through the Hot Spot while the other can be adjusted to give a temperature variation of carburetor air from atmospheric to the maximum obtainable. These valves can be used either as seasonal adjustments or connected to cockpit controls, although it is recommended that in all cases the hot air valve be controlled from the cockpit.

The hot air valve is built into an air scoop which is furnished as part of the standard equipment. It is so constructed that with the Hot Spot operating and the hot air valve open, that is, to the position of cold air, a circulation of air sufficient to prevent burning of the pipes is still maintained. The hot air valve is also so constructed that in case of an engine backfire it opens auto-

matically and allows the flame to pass out under the fuselage rather than up through the hot air pipes.

The design has been made to be as far as possible universal so that it can be fitted into existing airplane structures with the least amount of trouble.

MISCELLANEOUS

The Anglo-French Naval Agreement—Press Comment

The Literary Digest, Aug. 18.—A development of the first significance and, perhaps, of great promise for the cause of disarmament, is seen by a number of American newspapers and their foreign correspondents in the recent announcement of Sir Austen Chamberlain, British Foreign Secretary, that Great Britain and France have reached a tentative agreement on naval limitation that may open the way to a general accord wholly satisfactory to the United States. Although the details have not been made public, it is said that France has abandoned the stand that she took at the Washington Conference, namely, that in contemplating naval reduction she would take into consideration no figures except those of total tonnage, and has agreed to a limitation of vessels by classes, in accordance with the plan followed in the Washington treaties.

In return for this concession to the British view in the matter of naval armaments, the British are reported to have agreed that trained reservists shall not be included in the list of France's land armaments. Furthermore says the Paris correspondent of the Manchester, (England), *Guardian*, "it would seem, from leakages in the French press, that the French and British have achieved a new *entente cordiale* of at least equal importance with that of 1914, and perhaps even more far-reaching. It would seem, in fact, as if a pooling of the French and British fleets were again about to take place, somewhat similar to that which existed—although it was concealed from the British public—before the outbreak of the World War."

In Washington official circles, emphasis is placed on the statement that the Anglo-French plan is not an agreement between France and Great Britain to limit their naval strength, but a plan recommending a basis on which such an agreement might be reached. Probably the most important phase of the tentative accord is that, for the first time, France now agrees to consider seriously limitation of auxiliary craft, and particularly submarines. As the Baltimore *Sun* remarks:

> Two points appear in the discussion of the understanding between the British and the French on naval limitation.
>
> The first is that the understanding does not effect any kind of limitation, but seems to settle the dispute between the two countries, which has lasted for the better part of a decade, as to the principle upon which limitation shall be approached. The French agree, in general, to the British thesis that limitation should be by categories—that is, limitation should be effected as to capital ships as a class, as to cruisers and destroyers as a class, and as to submarines as a class. The French had always insisted that a total tonnage should be determined and each nation left free to build whatever kinds of ships it desired. The French shift of base should make it possible, when disarmament parleys are resumed in Geneva, for the two nations to talk about specific limits, instead of to debate interminably over opposing theories of limitation.
>
> Instantly arises, of course, the question whether the United States is now confronted with an Anglo-French combination that may be embarrassing. Until there has been careful analysis of the British note, a definite answer cannot be made. But the probabilities seem to be against embarrassment. The United States has stood with Britain against France and other continental Powers for limitation by categories. Thus, the Anglo-French agreement, on its face, appears to be favorable to our own position with respect to the fundamental issue.
>
> The second important point in the discussion of the agreement does not have to do with limitation of armaments. It has to do with the question whether, in reaching this agreement, the British and French have, in effect, renewed the old *entente*, and in such form that it virtually amounts to an alliance. Paris has suggested as much in cables, and in the columns of its own papers. There has been talk of a bargain which involved an understanding as to reservations on the Kellogg treaty to outlaw war, and also a British concession of freedom for the French in land armaments in return for the French concession in naval affairs; with the whole looking toward a united front against Germany or any other Power, say, Italy, that might prove dangerous to either of the partners. It would be well to await further information and discussion before this talk is accepted.

In the opinion of P. W. Wilson, an authority on European politics, "Britain and France are acting together in what must be regarded as an alliance, and any Anglo-French alliance of navies from which Italy is excluded will naturally be regarded by the Mediterranean Power as directed, in ef-

fect, against her. As a condition accompanying the limitation of naval armaments, France would concentrate her fleets in the Mediterranean and Britain would concentrate hers in the North Sea and the Channel. Also, Britain would guarantee the northern coasts of France against attack by sea, while France would guarantee the Channel ports from attack by land." Continues Mr. Wilson, in a New York *Times* résumé of the situation that has developed since Sir Austen Chamberlain made his pronouncement:

France has insisted hitherto upon the globular method, as it is called, of estimating the strength of a navy. In any comparative schedule affecting known and other fleets, she would take into the reckoning no statistic except total tonnage. She would say that 35,000 tons is 35,000 tons. If Britain likes to build one battleship of that displacement, so be it. But that is no reason why France, on her side, should not build thirty-five submarines, each displacing a thousand tons.

It is easy to appreciate the reasons underlying this Gallic logic. France does not depend on a battle fleet. But she is acutely conscious that submarines may exercise enormous influence over the commerce, and even the food supply of a crowded island like Great Britain. She is also anxious to have cruisers able to safeguard her communications with Africa when she has recruited a large native army.

Great Britain, on the other hand, has no use for submarines. She regards them as essentially weapons of offense; and at Washington, in 1921, she proposed their total abolition—to which proposal France declined to agree. Britain insists, then, that a schedule of comparative navies shall be analyzed into classes of vessels—battleships, cruisers, submarines, and so on; and that class shall be matched against class.

The United States and Japan have agreed with the British and disagreed with the French method of calculation. It is thus held to be a gain for the cause of peace that France should have now accepted the prevailing verdict of naval experts. She agrees to analyze her Navy. Further, she agrees that submarines above 600 tons shall be limited.

With regard to cruisers there is, however, this to be said. Both Britain and France, with their easily available coaling stations, want cruisers of a smaller tonnage than that which is desired by the Navy Department at Washington.

It cannot be claimed, then, that the naval difficulties which proved so formidable this year at Geneva have been as yet disentangled. What can be asserted is that the United States has received what is tantamount to an invitation to renew the discussions, and that the invitation comes from two European Powers which, hitherto, have worked against one another.

The Anglo-French accord is now to be submitted to the other Powers which participated in the three-Power conference at Geneva. It may then be handed over to the Preparatory Disarmament Commission of the League of Nations for further scrutiny. In the opinion of the Providence *Journal,* the Chamberlain announcement is the most important development in international naval affairs since the Geneva Conference:

There can be no doubt that the reconciliation of the conflicting British and French points of view will go far toward promoting the success of a future international naval limitation conference. For if France has made concessions on the long-standing issue of the proper method of computing naval strength, it is reasonable to believe that Italy will go as far as France in compromising with Great Britain. It would not be surprizing, therefore, if another Geneva conference is called to see representatives of the United States, Great Britain, Japan, France, and Italy sitting down together, instead of merely those from the first three of these nations. That in itself would be a distinct step forward in the direction of the goal of naval limitation.

What must be avoided, above all things, is that lack of preparation which did so much to cause the failure of the tripartite conference at Geneva. The bulk of the work of accomplishing the admittedly common object of all five nations—and indeed of lesser naval nations as well—must be done through the various foreign offices before any delegates are chosen. There is a universal desire to lessen the burden of maintaining adequate naval strength. The accomplishment of that desire awaits the proposal of a suitable method of reduction. Great Britain and France are to be congratulated on making some further contribution to the common endeavor to discover a universally acceptable method.

Although the note which Sir Austen sent to the United States, Japan, and Italy apprizing them of the Anglo-French agreement has not been published, "the very fact that some understanding has been reached is a happy augury for the disarmament conferences of the future," thinks the New York *Evening Post.* This is the conclusion reached by a number of other dailies, including the Philadelphia *Public Ledger,* Brooklyn *Eagle,* Nashville *Tennessean,* and Baltimore *Sun.* To the Baltimore paper, "the announcement shows that the pressure for disarmament is still effective on governments," and the Tennessee daily believes that "if England and France can compose their radical differences, then it ought not to be a difficult matter for the other Powers to come to an agreement upon the limitation of armaments."

There is, on the other hand, considerable editorial skepticism of the Chamberlain

note, and the admission that, as the Manchester *Union* puts it, " no settled judgment can be reached until further light is obtained." As this paper explains:

The attitude of the United States on the cruiser question at Geneva last year was in sharp contrast with the British position. Great Britain favored the limitation of 10,000-ton cruisers armed with eight-inch guns, but insisted on building many smaller-type cruisers armed with six-inch guns. This demand was plainly favorable to the British system of naval bases, and distinctly detrimental to the American system with its few naval stations. The 10,000-ton cruiser is not essential for the protection of British trade routes. The frequency of naval bases makes it possible for Great Britain to operate smaller ships with a restricted cruising radius, that could not be employed with advantage by the United States. Great Britain offered to set a gross tonnage for cruisers within which any country could build, but it was immediately apparent that such a provision would place the United States at a disadvantage unless parity could be achieved regarding the size of cruisers. This was the rock on which the Geneva conference was wrecked, and unless the Anglo-French agreement has pointed out some way of breaking this deadlock, it is irrelevant, as a means of compromise, from the American point of view.

It was hoped when the announcement of the agreement was first made, that France and Great Britain had reached an understanding on the submarine question that would enable Great Britain to modify her position regarding cruisers. It was felt that if Great Britain has persuaded France to limit her submarine program, this action might materially affect the former's cruiser policy. But if, as now seems probable, France has simply joined Great Britain in urging the British position on the Preparatory Commission at Geneva, the agreement has a purely European significance. America's plan of naval limitation has been clearly stated. This plan is vital to our safety, and while the Government at Washington will not hold aloof from any effort after the restriction of armaments and the removal of competition in arms, it must be understood that on certain principles which we consider essential to our national well-being we must remain inflexible.

"The reported Anglo-French compromise," agrees the Norfolk *Virginian-Pilot,* "would seem to be a matter that concerns Europe alone." To this paper:

It represents an adjustment of what appears to be a more or less localized controversy between France and England, arising partly out of France's fear of the British Navy and its determination to retain the fullest freedom in the development of the submarine as a protective device, and partly out of England's fear of the French submarine and the French Army with its rapidly expanding air forces. But this more or less localized controversy may be said to have exercised a powerful influence on British naval policy, both at Washington and at Geneva. With France refusing to make concessions in the matter of the submarine, and building up a large military air force at the same time, England found it more difficult to agree to proposals for naval limitation in general than would otherwise have been the case.

The Franco-British naval compromise is not, however, without possible drawbacks. France and England arrived at their understanding without consulting Italy, which, as one of the chief Mediterranean powers, is interested in whatever military or naval policies France may pursue. The Italian reaction to the Franco-British compromise on armaments remains to be disclosed. Until it is made completely clear, it cannot be said that the way has been cleared for a solution of the problems of naval limitation likely to arise during the next few years. As for the matter of limiting land armaments, that remains as always a most difficult question in answering which not only France, England, and Italy must have a voice, but also Germany, Russia, and, probably, Japan. The prospect in this quarter is not yet either clear or promising.

London *Times,* Aug. 20.—The subject of the Anglo-French naval compromise is again uppermost with the announcement from an official source that definite instructions have been received in Washington from President Coolidge forbidding any further exchanges dealing with the matter until his return to the White House. This naturally does not mean that Mr. Kellogg will not—for he undoubtedly will—discuss the question while he is in Paris and London, and I have already reported that the United States Government would have nothing to say on the issues involved until Mr. Kellogg again has been able to deal *viva voce* with the President.

There is every reason to believe, however, that the displeasure which President Coolidge privately manifested after the failure of the Geneva Conference has been revived by the circumstances attending the Anglo-French compromise and by what is known or suspected of its nature. The recent visit to his summer headquarters of Rear-Admiral Hughes, Chief of Naval Operations, placed at his disposal the Navy Department's views of the matter, which, briefly stated, is that Great Britain has conquered her earlier repugnance to the submarine in order, tentatively at least, to agree upon limitation in the only type of cruiser which the United States must build, and unhampered freedom to construct the vessels desired by Great Britain but useless to the United States. This, whether right or wrong, is how the Navy Department sees

things, and there are not wanting those at the State Department who also hold this opinion. Their perturbation has been transmitted to the President, who, it now appears, has discovered yet another cause for anxiety.

This took the form of a dispatch from Paris to an American newspaper written by a British correspondent and more than hinting that the compromise might actually amount to an arrangement whereby the British and French Governments would pool their naval resources in extraordinary circumstances. Here, it is said by eager commentators, is a prospective and flagrant violation of the spirit of the Washington Naval Limitation Treaty of 1922; and President Coolidge, if he is not ready to believe that this is intended, has, nevertheless, been so impressed as to decide and to order that the extreme of caution must be observed if United States interests are to be adequately protected.

Today, with great unanimity, the United States press reports the receipt of an "intimation" that the United States delegation to the next meeting of the Preparatory Disarmament Commission will receive instructions to enter into no discussion of the armament problems until the questions arising out of the Anglo-French compromise have been settled, and that, in any event, the delegation will be required to insist upon a definite tonnage limitation in cruisers of 10,000 tons, smaller cruisers, and submarines.

Needless to say, discussion of the question in the press has not stopped there. What is called in some quarters a partial disclosure of the Anglo-French compromise is seen as part of a plan "to make it appear that Great Britain and France are anxious to secure the limitation of naval armaments, and that the United States, while flourishing the Kellegg Treaty in the world's face, is in reality opposed to naval limitation." In other words, "it is intended to influence American sentiment against the construction of additional cruisers." The suggestion might be ignored if it were not certain that the "Big Navy" group would make much of it, and that it is all too likely to take root in suspicious minds. More will be heard of the same sort when the Senate meets again in December, and proceeds not only to the ratification of the Kellogg Treaty but to the consideration of the bill, already passed by the House of Representatives, authorizing the construction of fifteen 10,000-ton cruisers, to be laid down five in each of the years 1929, 1930, and 1931. Great pressure will be brought to bear on the Senate to give the Cruiser Bill priority over the Kellogg Treaty.

Whether it come first or second, however, there is no reason to assume that the multilateral treaty for the renunciation of war as an instrument of policy will fail of ratification. It is not, save in the very highest altitudes of international dealing, related to the immediate problem of naval policy, as President Coolidge has been prompt in reminding the nervous, and other attempts to discredit it in its present form seem to be doomed to failure.

First, there was the allegation that Europe had placed, and would continue to place, upon the Pact an interpretation utterly at variance with the American understanding of its obligations and implications. A warning was issued that if, at a moment of European crisis, the United States refused to act, there would arise a storm of criticism and reprobation. To this view (supported, among others, by Mr. Frank Simonds) the reply is obviously that no reprobation to come would approach in violence the storm which would be raised by the present rejection of the Treaty, and since this greater storm would blow at home as well as abroad the politicians who would suffer by it will be careful to avoid its wrath.

Next in order was a suggestion that the Senate would be well advised to add to the Kellogg Treaty a reservation reminding the world that nothing it contained should be taken as weakening the force of the Monroe Doctrine. Since the Monroe Doctrine is, as Mr. Hughes reminded the world in 1923, a policy of self-defense, and since self-defense is held to be so imprescriptibly the right of any and every nation that the Kellogg Treaty need not even include a reference to it, the suggestion has little force; but, even so, the Senate might—by way of making assurance doubly sure—incline to something of the sort if it were not for another consideration.

The effect upon Latin America of such a reservation, and the meaning which would be given to it in that part of the world, would be nothing short of deplorable, and

even the Senate will be likely to see this. The maintenance of the Monroe Doctrine reposes ultimately upon willingness to resort to arms, and everybody knows that the moment of the ratification of a treaty renouncing war as an instrument of policy would not be the appropriate moment to insist on the fact.

Baltimore *Evening Sun*, Aug. 27.—Paris, Aug. 26 (Special Cable)—Leon Blum, leader of the French Socialist party, makes a statement in *Le Populaire* today which should be of great interest to the British Labor party and the United States Government.

He declares the *Temps* now uses in semi-official accounts of the progress of the Anglo-French naval compromise phrases which indicate the "compromise" is something more than a naval disarmament plan and that the *Temps* believes it to be some kind of a pact for mutual "security."

Blum protests against the dangers of any such mutual compact or merger or division of the functions of the British and French fleets.

> Surely it is as plain as plain can be [he writes] that the moment you turn the British and French fleets into two complementary forces, practicing in regard to one another a sort of division of labor and distributing among themselves in advance the case of building and the case of the need of certain strategic functions, from that moment any conventions for the limitation of naval armaments made in the past or to be made in the future will be altered and falsified in spirit in relation to the two contracting parties. Instead of accelerating the hour of general disarmament the clock is put back.

The Socialist leader agrees, therefore, in effect with opinion attributed here to Washington that if the Anglo-French naval compromise implies everything stated for it in the Paris press, it clearly indicates a distribution of functions along the pre-war precedent between British and French fleets, thus constituting a grave violation of the Washington treaty.

Blum demands the fullest publicity in the matter.

Le Populaire, in a separate article, declares:

> What is behind the document that matters? The American government has the text but the odds are overwhelming that it is not the text that causes anxiety but the far-reaching political consequences. Here we have something that puts an end to an Anglo-American naval quarrel going on since the end of the war and which revealed itself to the point of scandal at the Washington Naval Armament Conference and later at the Geneva Conference.
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> The text of the document that allows and facilitates certain agreements between the British Admiralty and the French Ministry of Marine—agreements which, though not put on paper, carry heavy consequences if what they mean is to turn the British and French fleets into two specialized sections of the same fleet, then quite frankly it would mean a re-opening of the naval race in armaments.

Le Populaire adds that, in other words, it is positive the United States would not tolerate such an *entente*, constituting a breach of the parity agreement between the British and American naval forces to which, *Le Populaire* reminds, Great Britain is formally pledged.

German Naval Policy

The Naval and Military Record, July 14, 1928.—The results of the late Parliamentary elections in Germany certainly seem to justify the conclusion that monarchism is moribund, if not dead, and one rather wonders how far the same thing may apply to militarism. That a nation should completely change its traditional temperament within a few years is rather hard of belief, and, if the "national industry" of Prussia is just now unpopular, it is probably because of the realization that it has failed to pay. Those who should be in a position to speak with knowledge assure us that in the German Navy the "old spirit" survives more strongly than in the German Army. There is no suggestion that the Germans are failing to observe the peace conditions, but it is interesting to note that their current naval budget is so adroitly drafted that nobody can tell precisely what it means. The total of the estimates for 1928 is 210 million marks, as against 162 million marks for last year. But about one-half of the appropriations are provisional, which means that they can be applied to any other purpose than that for which they were voted. Such a method of finance appears to offer distinct opportunities to an enterprising naval ministry.

The German naval administration is almost ludicrously out of proportion with the present very slender dimensions of the fleet. The General Staff, for example, numbers seventeen distinct sections. There are fourteen subdivisions for the only navy yard left, and for one shipyard, four inspecting organizations, two commissaries with thirty-

one sub-divisions, and an administration of proving grounds. It has been alleged that constructional costs are heavily "faked," so as to leave free money for other purposes. The French journal *Le Yacht* recently gave an example. The artillery for the new cruiser *Karlsruhe* is shown as costing fourteen and one-half million marks, or eighty-five million francs, while the real price of these guns is not more than twenty million francs. There is no breach of treaty faith in such financial juggling, but one rather wonders what reason lies at the back of it. Is the over-estimated money being saved, or is it being spent in other directions not revealed in the naval program? The disaster which resulted from the explosion of a great reservoir full of phosgene gas in Hamburg caused an uneasy impression. Somehow the existence of a reserve of this stuff does not seem to go well with the Locarno spirit.

Still, public opinion in this country is not very much concerned with what Germany may be doing with her naval programs. We are quite satisfied that nothing she may be doing, or can do for many years to come, is in any way directed against the British Navy. One's own view is that an adequate and efficient German Navy is a necessary complement to the peace of Europe. Without the existence of such a navy the Soviet fleet would be dominant in the Baltic. In such a situation it might do no more mischief than the other section of it is doing in the Black Sea, although the comparison is rather a false one, because there is not very much scope for mischief in the Black Sea. But, on the other hand, it might. As a fighting force the Russian Navy of today may not be very formidable, for communism and effective military organization never did and never will go together. But opportunity is the great handmaiden to Bolshevism. The annual visit of a British cruiser squadron is particularly distasteful to Moscow, although it never goes near Russian territory and has absolutely no reference to Russian politics.

Whatever else Germany may stand for, Bolshevism is never likely to enter into the category. Therefore, we may take it that the German Navy stands as an assurance against Russian intrigues in the Baltic. The new Polish Navy is as yet a very small force, and, with the Danzig Corridor as a perpetual thorn in her side, Germany has no particular reason to love Poland. Yet we very much question whether the German Navy would idly stand by if the Red Fleet became hostile to the Polish Navy. Denmark and Scandinavia have reduced their naval strength to almost negligible quantities, and here again, the existence of the German Navy is a pretty good assurance against any risk from this policy. But Germany herself is naturally looking beyond the Baltic in a naval sense. Last year the amount of German mercantile tonnage passing through the Suez Canal showed an increase of more than twenty per cent upon the corresponding figures of the preceding year. All the world admits that a big ocean trade justifies adequate naval protection. The new cruiser *Emden* has been showing her flag all around the world, just to remind the world that that flag still flies. But without a single naval base outside of the Fatherland it is rather in the nature of a fugitive display.

CURRENT ARTICLES AND BOOKS

"The Polyphase Induction Generator." D. F. Alexander in *The Electric Journal,* August, 1928.

"How the Navy Selects Its Lubricants." Comdr. T. J. Keliher, U.S.N. in *Manufacturing Industries,* August, 1928.

"Recent French Developments in Surface Condenser Design." R. H. Andrews, in *Power,* August 21, 1928.

"Admiralty Floating Docks," "Slotted Wings and the Automatic Slot." *Engineering,* August 10, 1928.

"Notes On the Design of Propellers," by G. S. Baker, in *The Engineer,* August 3, 1928.

"The General Trend of Modern Development in Steam-Turbine Development," by H. L. Guy, in *Power,* August 7, 1928.

"Antarctica: A Treatise on the Southern Continent," by J. G. Hayes.

"The Freedom of the Seas: A Non-technical Discussion of the Policies pursued by Naval powers," by Kenworthy-Young.

NOTES ON INTERNATIONAL AFFAIRS

From August 3 to September 3

Prepared by Professor Allan Westcott, U. S. Naval Academy

THE PACT OF PARIS

Treaty Signed.—On August 27, in the Salle des Horloges, Quai d'Orsay, Paris, representatives of fifteen nations signed the Briand-Kellogg treaty for the renunciation of war, or to use its shorter name, "The Pact of Paris." Secretary Kellogg signed for the United States and Foreign Minister Streseman for Germany. In the absence of Sir Austen Chamberlain, owing to ill health, England was represented by Lord Cushendun as Acting Foreign Minister. M. Briand of France, the only speaker, read a brief, eloquent address in which he described the treaty as a magnificent beginning of the work which all the signatories must carry forward. It was believed that the other nations signing the treaty will defer ratification until action has been taken on it by the United States Senate.

Other Nations Invited.—After the signing of the anti-war treaty invitations were extended to all nations not already signatories to join in the agreement. These invitations were given by the United States to nations with which this country has diplomatic relations, forty-eight in all, and by France to the Soviet Republic. The latter agreed to sign, with adverse criticism regarding the American Monroe Doctrine and the British claim of spheres of vital interest.

Armaments Not Affected.—In a speech before the Wisconsin State Convention of the American Legion on August 15, President Coolidge said he foresaw no reduction of the United States Army or Navy as a result of the Paris agreement. He viewed our Army and Navy as purely defensive weapons, moderate in size and never maintained for aggression, and therefore not affected by a treaty designed to prevent attack.

Criticism of Treaty.—At the Williamstown Institute of Politics on August 21, Professor E. M. Borchard of Yale, an expert on international law, made a vigorous attack on the anti-war treaty, asserting that in view of the French and British reservations the treaty "constitutes no renunciation or outlawry of war but in fact and in law a solemn sanction for all wars mentioned in the exceptions and qualifications." "It would be difficult," he added, "to conceive of any war that nations have fought within the past century, or are likely to fight in the future, that cannot be accommodated under these exceptions." Professor Borchard declared that the renunciation of "war in the abstract" in the first article of the treaty meant little in view of the sanction to "wars in the concrete" which he insisted was given by the "accompanying construction of the treaty."

He argued that Secretary Kellogg's acceptance of the British reservations committed the United States to the recognition of the British claim to a right to make war "in certain undefined regions of the world," any interference with which by anybody including the United States, would be regarded by Great Britain as a cause of war.

"No such broad claim of the right to make war has ever before been recognized," said Professor Borchard. The Monroe Doctrine, he added, was limited to a certain part of the world, but the British reservation had no geographical limitation.

"But the most extraordinary feature of

this treaty," he continued, "is that we recognize the legality of League wars and Locarno wars, as Europe correctly seems to assume, we would be bound by League decisions as to aggressors and League policy generally but without any opportunity to take part in the deliberations leading to League conclusions."

While Professor Borchard's criticism was met by a warm defense of the treaty, it may be expected that the same arguments will be used when the treaty comes before the Senate for ratification.

Treaty And League.—The British Government on August 9, sent to the Secretary General of the League of Nations a note asking him to call the attention of the League Council and Assembly to the British declarations that the anti-war treaty should in no way affect the rights or duties of England as a member of the League of Nations. The effect of this, it appeared certain, would be to bring the treaty up for discussion at the League council meeting on August 30 and the Assembly opening on September 3. According to a New York *Times* despatch from Paris on August 9, questions which might be raised in these discussions were such as the following:

Suppose the League countries started to operate an economic blockade against a violator of the League Covenant. What guarantee would they have that this would not divert the trade of the alleged offending nation from their marts into American marts?

Suppose a naval blockade were laid down. What guarantee is there that America with her great fleet would not demand freedom of the seas for her commerce with the nation which had violated the League covenant?

The American factor has completely blocked progress in perfecting sanction remedies for war or dangers of war.

But a violator of the League Covenant would become a violator of the Kellogg treaty. And what then? Would not America in backing up her own treaty, to quote Sir Austen Chamberlain, agree not to interfere with efforts of League members in applying sanctions? Would America not agree that she would not do business with or aid the nation which violated her own treaty and at the same time violated the League Covenant?

That is what the European statesmen wished to discuss with Mr. Kellogg and that is what they are going to discuss without Mr. Kellogg. The question is important.

FAR EAST

Sino-Japanese Treaty Dispute.—The difficulty between China and Japan over their commercial relations continued through August. Japan on July 31 sent a blunt note to the Nationalists declaring that the old commercial treaty was still in effect, and that Japan would not consent to see it "summarily canceled," or to accept "unilateral provisional regulations" prior to the negotiation of a new treaty.

The reply of Foreign Minister Wang was conciliatory. While not receding from the contention that the old treaty was no longer effective, he pointed out that a similar policy had been adopted toward other nations. As regarded the provisional regulations, these had not actually been put in effect, the old treaty remaining in force in practice. It appeared clear from the note that the Nationalists were not ready for actual conflict with Japan.

Japan in Manchuria.—The difficulties between China and Japan over commercial regulations had a direct bearing on Japanese policy in Manchuria, since abrogation of the old treaty, combined with Nationalist control of Manchuria, might interfere with Japanese economic exploitation of the northern province. Early in August Manchuria's dictator, Chang Hsueh-liang, was on the point of signing an agreement with the Nationalists, the terms of which were reported to be complete domestic autonomy for Manchuria, with Nanking control of foreign relations. This arrangement was upset, and Chino-Japanese relations were for the moment severely strained, when Consul General Hayashi, the Japanese representative at Mukden, advised Chang against concluding the agreement. Needless to say the "advice" from Tokio was accepted.

Perhaps the best explanation and defense of Japanese policy in Manchuria was given to the press by Baron Hayashi on August 17:

The position, as Baron Hayashi sees it, is that everywhere in China is instability and uncertainty. At Mukden, Chang Hsueh-liang is sick and his political position is insecure. At Nanking, Chiang Kai-shek also is insecure, with rivalry between him and Feng Yu-hsiang liable to break out at any time. Baron Hayashi is inclined to think that Feng is the stronger man of the two and that his strategic position is much stronger. Chiang Kai-shek is trying to attract Mukden in order to strengthen himself against Feng, in Baron Hayashi's view.

Under such circumstances, said the Baron, nothing can be done but wait events, and Japan is compelled at each changing phase to take what-

ever steps are feasible to keep the peace in Manchuria, whose rich taxable capacity is coveted by the war lords, who have squeezed the rest of China dry.

"We have no objection whatever to Manchuria uniting with a unified China, but the greatest objection is to seeing Manchuria dragged into a civil war," he declared.

Asked whether there was any substance in rumors that the Japanese Government is seeking an opportunity for a protectorate or annexation, Baron Hayashi said that Japan certainly did not want to make Manchuria a protectorate, calling it a "costly and dangerous policy." As for annexation, he said: "I do not think anything would draw Japan into an annexationist policy."

FROM *NEW YORK TIMES*, AUGUST 18. ARROWS MARK POINT AT WHICH MONGOLIAN CAVALRY CUT THE CHINESE EASTERN RAILWAY

Baron Hayashi said Chang Hsueh-liang had promised him he would not proceed with the Nanking agreement and that the matter would remain in suspense for three months. The Baron asserted that Nanking's abrogation of the commercial treaty had not influenced Japan's action at Mukden, which was solely intended to keep Manchuria out of internecine strife.

MONGOL RAIDS IN MANCHURIA.—Trouble on the frontier between Mongolia and Manchuria broke out on August 17 when a raid of Mongolian cavalry, led by the former White Russian General Sukovsky, cut the Chinese Eastern Railway at Khailar. A Manchurian force was despatched to restore order and protect the railway.

Outer Mongolia (see map) was proclaimed a Soviet Republic in 1925. Inner Mongolia, on the other hand, has remained outside Russian control, and last June proclaimed adherence to the Chinese Nationalists. The recent raid was explained as a move on the part of Nationalist leaders in Mongolia to persuade or force the northern part of Manchuria to join the Nationalists. According to this explanation, Soviet influence was in no way responsible, but foreign observers were inclined to see every disturbance in this region as part of a Soviet plan to bring Inner Mongolia and Northern Manchuria under Soviet rule.

According to a Peking despatch to the New York *Times* on July 26, the Soviets are not only tightening their hold on Outer Mongolia, Chinese Turkestan and Thibet, but effectually shutting Chinese and foreign trade out of vast areas of Inner Asia.

NANKING SETTLEMENT.—The British settlement with the Nationalists for injuries resulting from the Nanking Incident of March, 1927, was similar in terms to the settlement made by the United States, providing for apologies and payment for injuries to British persons and property. The British agreement was signed on August 9. Mr. Edwin S. Cunningham, United States Consul-General in China, inspected in August the American consulate at Nanking, which for more than a year had been occupied by Chinese soldiers. It was assumed that the consulate would soon be reopened.

LEAGUE AND WORLD COURT

Hughes Assured Judgeship.—By the close of August those interested in the election of ex-Secretary of State Charles E. Hughes to the bench of the World Court had assured for him the vote of thirty-two nations, a majority of the fifty-three nations in the League Assembly. Mr. Hughes has signified his willingness to serve.

League Council Session.—The League Council met at Geneva on August 30, in preparation for the Assembly session opening September 3. To a request from Costa Rica for an interpretation of the application of the Monroe Doctrine, the Council was reported to have refused a reply, on the ground that the Doctrine concerned only the American nations.

At the suggestion of Premier Mackenzie King of Canada, the Council gave the United States an opportunity to share in its work by an invitation to send a representative to the January session. The purpose would be to participate in the work of the new central board created by the 1925 opium convention for control of international traffic in drugs.

As a result of conferences between French and British delegates, it appeared likely that another session of the Preparatory Disarmament Commission would be held in November or December. No agreement was reached on control of production of war materials, the special committee reporting that while all governments represented were agreed on the principle of publicity for both public and private production, they differed as to whether this publicity should give only the total value of material produced, or details as to weight, number, etc.

GREAT BRITAIN

Anglo-French Naval Agreement.—While the exact terms of the July naval agreement between France and England remained unpublished, it was understood that France had receded from her former insistence on reduction by "global tonnage" and had accepted the idea of reduction by classes or categories of ships. For this purpose a classification was agreed upon for discussion at future sessions of the disarmament commission, subject of course to the approval of other naval powers. The proposed classification was in four groups:

(1) Capital ships, over 10,000 tons
(2) Airplane carriers, over 10,000 tons
(3) Other surface craft under 10,000 tons, of 6 to 8-inch guns.
(4) Submarines over 600 tons.

It appeared that cruisers of 6-inch guns or under would not be subject to limitation, thus providing for England's insistence on small cruisers; and France could build as many submarines under 600 tons as she pleased. The proposed scheme did not meet the requirement of the United States for cruisers of larger size; and hence it did not appear that the Franco-British plan would facilitate naval limitation.

It was taken for granted that French concessions in naval limitation had been secured only by British acceptance of French military policy, which would leave the French army and vast trained reserves untouched in measures for disarmament. Both British and French authorities denied that any understanding had been reached for associated use of the French and British fleets. The agreement, however, stood as a definite evidence of a renewal of the Entente cordiale, and a sign that France and England would endeavor to work together in European and world affairs.

England in Egypt.—A letter from an American resident in Cairo, in *Time* of August 21, ridicules the idea that England needs to garrison the Nile valley for two thousand miles in order to defend the Suez Canal, which he says is adequately protected by British naval control of the Mediterranean. "The British rule Egypt well," he writes, "but it is for Empire revenue and not for self-defense. Even the Egyptians are beginning to see the military absurdity of the plea that it is necessary to occupy Khartoum in order to keep Mussolini out of Alexandria.

GERMANY

First Large Cruiser Voted.—The Mueller Cabinet in Germany approved on August 10 an appropriation of nine million marks toward construction of the first of a series of armored cruisers for Germany's new Navy. In answer to criticism of the action by communists as a waste of public funds, it was pointed out that the appropriation had already been approved by the

Reichstag and the Federal Council, provided the Cabinet would affirm that the state of public finances warranted the expenditure.

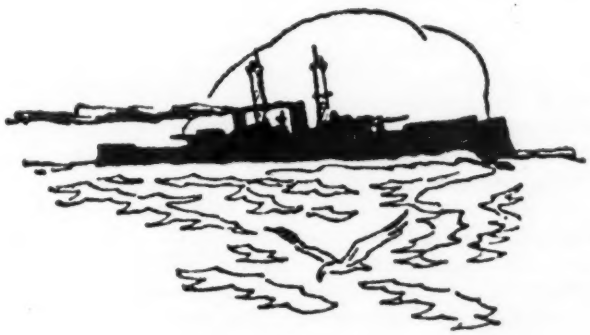
NEW SHIP CONSTRUCTION.—In August the North German Lloyd liners *Bremen* and *Europa*, of over 46,000 tons, were launched. Since the war German merchant marine tonnage has risen from 600,000 tons to 3,500,000 tons, or three-fifths of pre-war tonnage. The American merchant marine is 16,887,501 tons, and the British 22,782,573.

SOUTHERN EUROPE

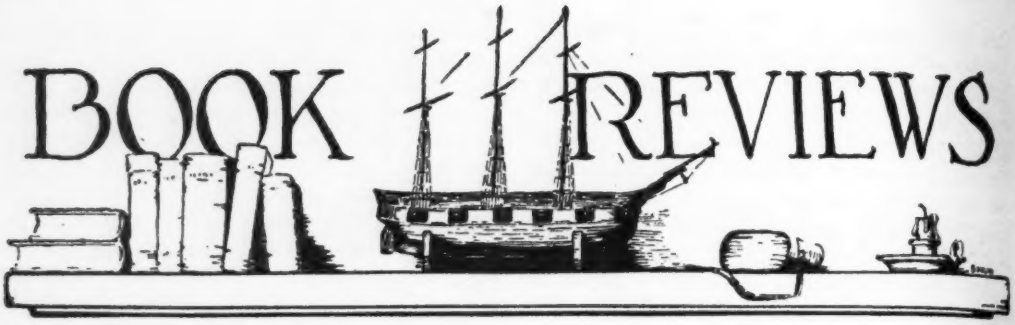
NETTUNA TREATY RATIFIED.—Upon the withdrawal of the Croatian and Agrarian deputies from the Jugoslav Skupschtina (parliament) following the shooting of their leader Raditch last June, the parliament in mid-August ratified by the narrow majority of one vote the Nettuna Conventions with Italy. These conventions were signed three years ago, but ratification has since been desperately opposed by Croatian and Dalmatian elements in Jugoslavia. The conventions grant some concessions to Italians, including permission to own property within thirty miles of the Adriatic coast.

Parliament adjourned on August 14 until September, and in the meantime efforts will be made to bring together the factions now intensely hostile. At the bottom of the emnity lies the feeling of the Croatians that they have been made merely a part of a greater Serbia and have not been given an adequate measure of local autonomy or share in the national government. This feeling has been intensified by the death in August of their leader Stefan Raditch as a result of the wounds inflicted in his attempted assassination last June.

VENIZELOS WINS GREEK ELECTION.—The Liberal party in Greece led by Premier Eleutherios Venizelos won a sweeping victory over its Royalist opponents in the parliamentary elections of August 19, securing 228 out of 250 seats. Venizelos came back into Greek politics as Liberal Premier on July 3 after the resignation of the Zaimor cabinet. He at once dissolved parliament and called for a new election on the basis of majority vote, discarding the former scheme of proportional representation.



BOOK REVIEWS



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ADVENTURES IN AMERICAN DIPLOMACY, 1896-1906. By Alfred L. P. Dennis, Professor of Modern History at Clark University. E. P. Dutton and Company, New York. Price $5.00.

REVIEWED BY REAR ADMIRAL W. L. RODGERS, *U. S. Navy (Retired)*

This work is a study of nearly twenty separate incidents in the diplomatic history of this country in the administrations of Cleveland, McKinley, and Roosevelt. Each separate adventure is dealt with in its own brochure, with its own notes and appendices, and is a complete story by itself. Nevertheless, together they give a most graphic and interesting account of the development of foreign policy of the United States at a time when it turned from an attitude of absorption in its internal development to contemplate itself with some surprise as a world power. The style is bright; we see the principals in the conduct of our foreign affairs as they saw each other at the time, and this lends piquancy to the whole work. The writer himself places his monographs in four different groups relating respectively to the Monroe Doctrine, the Panama Canal, American Policy as to Europe, and American Policy as to the Far East. It seems possible to unify the groupings still further and regard all the four groups as illustrating different phases of the commercial policy of this country as it has existed from the establishment of independence, and, of further interest to naval officers, many of these monographs indicate the dependence of diplomacy on force to give it weight in the councils of nations. To quote from a message of President Roosevelt to the German emperor, apropos of the Moroccan dispute (p. 488), "As a matter of principle, I never take a step in foreign policy unless assured that I shall be able eventually to carry out my will by force." Of course, the President himself would probably admit this was somewhat of an overstatement, but it had a substratum of truth which it is well to bear in mind in these days when lawyers are endeavoring to persuade the world that it may be governed by agreements to arbitrate disputes, a world court, and a system of rules without any force to compel observance of the *dicta* of the court. The idea that law can be made a satisfactory substitute for diplomacy backed by force is refuted by the first adventure in the book, the story of the dispute between this country and England over the Venezuelan boundary. Like all the incidents of the book the story is full of personal touches. We have the personal opinion, not for publication, which Mr. Olney, the Secretary of State, held of Mr. Bayard, ambassador to Great Britain, when the former found he could not get the latter to pass along his somewhat vigorous views on the British stand in the matter. But briefly the incident revealed this country as a world power to astonished Europe. For many years Venezuela had had a boundary dispute with the adjacent colony of British Guiana. England declined to take notice of the Venezuelan claims, feeling that they were ex-

travagant and also unenforceable. Accordingly, Venezuela tried to get the support of the United States. About 1884 the United States began to show a vague interest in the matter, which was continued through several years, during which Venezuela pressed on the government of this country that grave consequences to the independence of South America might ensue if Great Britain should seize a large part of Venezuela under pretext of a boundary dispute. Gradually the American opinion was forming and on Mr. Cleveland's second accession to office he believed the dispute should be ended. Cleveland was a strong believer in arbitration to settle international disputes and felt that the Monroe Doctrine was involved in the assertions of the British foreign office, which, early in 1895, declared that it would arbitrate nothing to the eastward of a boundary line it had proclaimed in 1866. The following July, Mr. Olney sent a note to London asking upon what principle except her feebleness as a nation Venezuela was to be deprived of her right of having the claim passed upon by an impartial tribunal. He urged arbitration in threatening terms and asked for an answer before the assembly of Congress. In November Mr. Olney twice cabled the ambassador to obtain a reply before the meeting of Congress, but Lord Salisbury was engrossed in other matters and made a mistake as to the date of the session. Accordingly, Mr. Cleveland, having had no reply to his somewhat forcible recommendations, included in his message to Congress a request for an appropriation to enable him to cover the expenses of an American commission to investigate and report with the least possible delay what were the proper boundaries; after which, he said, it would be the duty of the United States to resist the appropriation by Great Britain of any lands determined by the United States to belong to Venezuela. The result was a flare-up of feeling on both sides of the ocean, but in the end the British government agreed to arbitrate the case. The only reason for the change of British attitude was that it could not permit itself to quarrel with the United States when the latter was resolved on its course. It was not the military strength of this country that induced acceptance of its terms, for the Army and Navy were each scarcely one-sixth of the British forces. However, we were relatively strong, for the economic position of this country and the English political isolation in Europe were such that it was wise for England to grant to this country what she refused to the weakness of Venezuela.

The Spanish-American War is given a chapter in which the interest to naval men lies chiefly in the account of the German efforts to get a base somewhere in the Spanish colonies in the Orient. It is well known how the German admiral in command of the fleet in the Far East annoyed Admiral Dewey, and this is supported by a recent letter to the Navy Department. According to this story, when Dewey destroyed the Spanish fleet at Cavite and the news reached Europe by cable, the American ambassador at Berlin did not think it likely that the United States would care to retain the Philippines, and thereupon, without authorization from Washington, he visited the foreign office to say that if Germany were to be alert she would soon have an opportunity to profit by our reluctance to acquire territory. Accordingly Admiral Dietrichs was told to watch for such a chance and thereby irritated Dewey, who did not know that Mr. White in Berlin had started him. White notified Washington of his communication and was told to revoke it, but does not seem to have done so and thus permitted the bad feeling to continue between the two squadrons rather than confess his error. When Admiral Dewey was writing his book the present reviewer asked him if he would include this story and he said, "Yes," but when the book came out this incident was not mentioned. The need for weight of armaments to support matters of diplomacy at this time is shown in the efforts of Germany as early as the fall of 1897 to arrange a joint intervention in Cuban affairs "on behalf of monarchy." In spite of the annoyance felt by Great Britain on account of the dispute about Venezuelan boundaries, she firmly declined to take action unacceptable to this country. Republican France also was reluctant to intervene on behalf of monarchy. As Count Goluchowski of Austria announced in February, 1898, "only by a united and energetic naval demonstration would satisfaction be obtained." (*Am. Hist. Review*, 1924-5.) The joint note which was finally transmitted to the President a few days before this country declared war was

negligible because no naval demonstration accompanied it.

One of the most interesting chapters is the one quoting a letter of President Roosevelt in which he recounts how he secured the consent of Germany to arbitrate her dispute with Venezuela in 1902 at a time that the German fleet in Venezuelan waters was applying coercive measures and the President feared a permanent occupation of Venezuelan ports. The President sent for the German ambassador and told him that if the emperor would not agree to arbitration he would send the American fleet, then at Culebra, under Admiral Dewey, to Venezuela to see that no ports were permanently occupied. The ambassador said his emperor would not agree to arbitration, but a few days after when he saw the President again and said he had heard nothing from Berlin about arbitration, the President replied that in that case it was useless to wait for an answer as long as he had intended, and he would send Dewey south a little sooner. This brought the desired offer to arbitrate. As Mr. Dennis says, "We were eager for arbitration and for the settlement of disputes, yet our navy was, in effect, both an instrument of policy and an agent for peace" (p. 279). Such it still is and the country will be the loser if it ceases to be so.

The other point in these studies which demands particular notice from naval officers is the policy of the "Open Door." Although the country as a whole did not awake to the importance of this commercial policy until Mr. Hay by brilliant diplomacy induced Europe to accept it in regard to China, yet it has directed our national efforts since the Revolution. Indeed, the Revolution itself was largely brought about by the insistence of the Colonies on commercial freedom. They objected to having their forests reserved for British battleships and to having their ships with cargoes for the continent of Europe obliged to stop in English ports to pay duties to the mother country. The War of 1812 was caused by belligerent interference with the freedom of neutral trade. The commercial policy of the United States was foreshadowed in the statement of the Declaration of Independence that "all men are created free and equal." That is to say, they have the right to equality of opportunity, and this doctrine was and is in opposition to the ideas of Europe, where opportunity is the privilege of the few. In international trade we still maintain the doctrine of the Revolution as to persons—equality of opportunity. This work tells with graphic power not only of the establishment of the Open Door in China, but also of the negotiations for the Panama Canal which the United States maintains for the equal use of all nations. The writer makes no generalization as to the lesson to be drawn from the study he has made of these individual diplomatic incidents, but the reviewer ventures to point out that the series seems to indicate that the American doctrine of equality of opportunity when applied to international business and commercial dealings can be carried out only under the backing of an adequate navy. As Mr. Roosevelt said and practiced, "Go softly, but carry a big stick." The policy sheet of the Navy Department announces that the task of the Navy is to support the commerce of the United States, and naval officers reading this entertaining work will see how the State Department and the Navy Department worked together to maintain the policies of the United States in 1896-1906.

ARMAMENTS AND THE NON-COMBATANT. By E. F. Spanner. Williams and Norgate, Ltd. 12/6 net.

Reviewed by Rear Admiral Joseph Strauss, *U. S. Navy (Retired)*

The author starts out with a preface in which he submits his "Creed" in eight items, the last and most important one demanding that technical societies and the public shall determine whether or not the "Fighting Services" have made correct decisions as to their plans and implements of war, winding up with a postscript which states: "Non-combatants pay the piper—they should call the tune." A wide application of this principle to other human activities would be disturbing, to say the least. The anxious relative of a patient about to undergo a serious surgical operation would hardly demand the same privilege, despite the fact that he may have to pay the bill. But it is a curious fact that war, the most complicated of all the sciences, receives from laymen more advice and criticism than any other activity.

One of the subdivisions of the book—amounting to nearly a hundred pages—is

entitled, "The Big Gun Bluff." This badinage reveals the temper in which the writer sets forth his arguments in favor of aircraft against battleships.

Mr. Spanner is a retired naval constructor. It takes considerable courage for one who has not been actively concerned with plans and instruments of naval warfare for even so short a time as two years, to attempt to sit in judgment on the efforts of today, so rapid is the evolution of naval science. But the author does not hesitate to traverse the views of those still high in authority, and of course responsible for all of their acts. These acts are as a rule the result of careful experiment and study; many of the experiments are, for obvious reasons, never disclosed to the public.

The "Battleship versus Aircraft" controversy which has raged for the past few years has engendered so much heat as to befog the issue. It is a pity that the protagonists of both sides are unable to discuss the question fairly and calmly. Mr. Spanner's book does little to dispel the fog.

LINE OF POSITION BOOK.

By Lieutenant Commander P. V. H. Weems, U. S. Navy: U. S. Naval Institute. $2.50.

REVIEWED BY G. T. RUDE, FORMERLY NAVIGATOR, *N.O.T.S.*

The science and art of modern navigation, in the two intervening centuries since its birth upon the invention of the sextant and of the compensated chronometer, have undergone marked improvements in the astronomic data, methods and instruments furnished the navigator, and in practice of navigation at sea. This advance has been particularly marked in the past quarter century in the many simplified methods of navigation introduced.

The actual work in navigating a vessel may be made to constitute absolute drudgery by the use of old and tedious methods, whereas it may be a real pleasure in the use of the many simplified modern methods and procedure. The navigator of today is indebted to those alert members of the profession who are developing and introducing short practical methods of an accuracy equal to the time-consuming methods of past years.

The *Line of Position Book* by Lieutenant Commander Weems, which has just been published by the U. S. Naval Institute, is an excellent example of the thought and ingenuity of those navigators who are ever seeking to simplify existing methods. This little volume of only forty-four pages, six by ten inches, contains all the data necessary for the determination of lines of position at sea, except those contained in the *Nautical Almanac.*

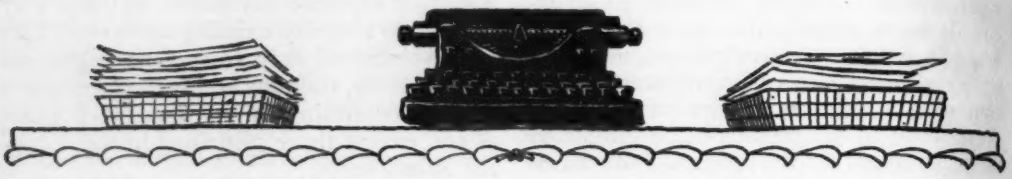
The remarkable simplicity of the method is not apparent upon first glance at the illustrative problems on page ten. By far the greater part of those problems consist of the calculation of the local hour angle and of the correcting of the observed altitude, both of which are common to all methods. The computation of the line of position is the most rapid of any known to the reviewer. Seven position lines can be computed by the Weems' method in the time required for the computation of two position lines by the Marcq Saint Hilaire method, after calculation, of course, of the local hour angles.

Many short methods and "gadgets" sacrifice accuracy to simplicity. The *Line of Position Book* does not. Perhaps when the observed body is near the horizon or the zenith, some accuracy is lost, but navigators never choose bodies for observation in such positions and seldom are required to use bodies at these altitudes. The reviewer computed and plotted a considerable number of star observations, suitably located as to altitude, by the Marcq Saint Hilaire method and by the Weems' method, with the position of the vessel assumed to be at the half degree of latitude, the worst possible position as to length of intercept for the Weems' method. The resulting positions by the two methods were practically identical.

Several tables are included for the use of the aërial navigator: table for correction to observed altitudes to 1000 feet; aviator's speed-time-distance table; and course correction table.

The navigator should experience a feeling of relief in the delivery, afforded by Commander Weems' compact little book, from massive tables, and give the *Line of Position Book* the popularity it deserves.

SECRETARY'S NOTES



The Special Information Number

In accordance with the policy of the Board of Control, this issue of the PROCEEDINGS is devoted to general information on the subject of the Navy. In its pages will be found a report on the whys and wherefores of the Navy. The activities of various branches of the Navy are carefully described by the persons responsible for these activities.

It is believed that the readers of the PROCEEDINGS will appreciate the articles in this issue, for, as friends of the Navy, they will welcome information about the Navy.

The "Marine" Number

Next month the PROCEEDINGS will feature the activities of the Marine Corps, a very important and very illustrious partner of the Navy. The two services are inseparably bound by the common heritage of the sea. Serving together and supporting each other, on land and on sea, the Navy and the Marine Corps form the nation's first line of defense.

In next month's issue there will appear an article by Colonel Otto, archivist of the German War Department, giving the German version of the battles for the possession of Belleau Woods; an article by Captain Thomason on the Marine Brigade, an article on Quantico, and one on the Boxer Rebellion in China more than twenty-eight years ago. This issue will be profusely illustrated and will be most interesting.

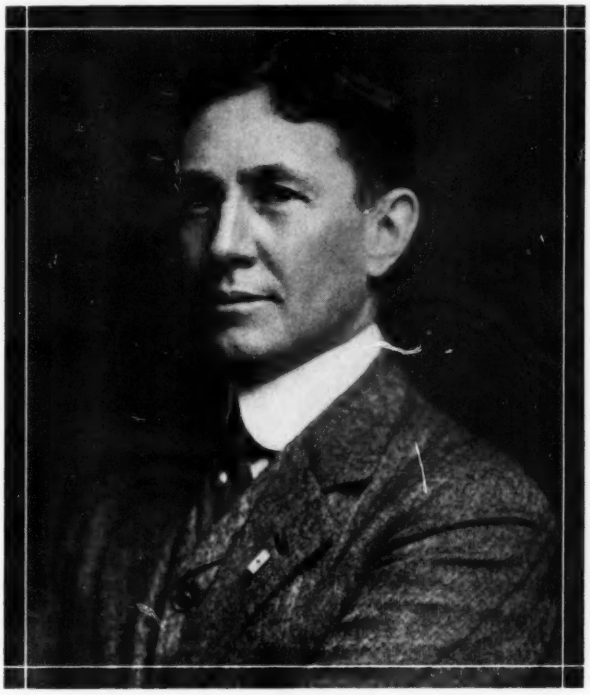
Navy Day

On October 27, the Navy will again be open to the public. This is the day that is set apart to show the people of the country what they have in the line of a navy.

The date is also the anniversary of the birth of Theodore Roosevelt, a strong supporter of our Navy. It is particularly fitting that this date should be chosen for our annual Navy Day, for Roosevelt is remembered as the Great American, "intense, vigilant, militant, uncompromising patriot, eager to serve the nation in peace or in war, who, throughout his life, was first and always an American."

There was never a time that there was any doubt where Roosevelt stood, when the welfare of America was at stake. His positiveness served to keep situations from developing.

The Navy is not concerned with internationalism; that is not its mission. It is for the purpose of serving this country, first and always. And that is a good reason for Roosevelt's birthday and Navy Day being one and the same day.



Distinguished Naval Academy Graduates in Civil Life

Henry Gerrish Smith

HENRY GERRISH SMITH graduated from the U. S. Naval Academy, 1891; assigned to the U. S. S. *Bennington*, then assigned to the Royal Naval College, Greenwich, England, for a three year course.

Returned to the United States in 1894; assigned to duty at Cramp's shipyard in connection with the building of the *Indiana*, *Massachusetts*, *Brooklyn*, and *Iowa*.

Assigned to duty at the New York navy yard in August, 1898; one of first duties at this yard was the repairing of ships damaged at the Battle of Santiago; assigned to duty in Washington in April, 1901, as an assistant to the chief constructor of the Navy.

Resigned from the Navy in November, 1903, and accepted position with the Fore River Ship and Engine Company as manager, remaining until 1917. During managership Fore River built the battleships *New Jersey*, *Rhode Island*, *Vermont*, *North Dakota*, and *Nevada*, and the Argentine battleship *Rivadavia*, also scout cruiser *Salem*, a large number of destroyers and submarines, and a long line of merchant vessels.

In 1918 went to Bethlehem, Pa; was manager of the Bethlehem Shipbuilding Corporation, Ltd., which took over the activities of Bethlehem Steel Corporation's various shipbuilding interests, consisting of the Fore River Shipbuilding Corporation, Quincy, Mass., Harlan & Hollingsworth, Wilmington, Del., Samuel L. Moore & Sons, Elizabeth, N. J., Sparrows Point Yard, Sparrows Point, Md., and Union Iron Works, San Francisco, Calif.

In 1920 became assistant to the president of the Bethlehem Shipbuilding Corporation; in 1923 was appointed vice president in charge of sales; since November, 1926, has been assigned to special duties as a vice president of the Bethlehem Shipbuilding Corporation.

In 1894 married Miss Betty Dent of Washington, D. C.; has two children, a daughter, Betty, and a son, Raymond.

Courtesy International Newsreel

PIGEONS RELEASED AFTER UNVEILING OF COAST GUARD WORLD WAR MEMORIAL

Photo shows hundreds of pigeons being released, after the unveiling of the World War Memorial of the U. S. Coast Gaurd at Arlington National Cemetery. Secretary of the Treasury Andrew Mellon performed the unveiling ceremony and made the opening address.

With the Fleet Twenty Years Ago

In the month of October, 1908, the fleet steamed past Zamboanga, in the southern Philippines, on north to Manila Bay, then on to Yokohama, Japan.

One of our illustrations shows the fleet passing Zamboanga. The small boats near the battleships were Army patrol craft, filled with the officers, men, and families of those stationed at Zamboanga. They followed the fleet until it passed out of sight to the northward. A good many had tears in their eyes, as they were a long way from home and the ships looked good to them.

Manila gave the fleet a rousing welcome and a round of entertainment. It was the first time since Dewey's fleet that such a considerable force of ships had been in Manila Bay. Then we went on our way to Japan.

The typhoon en route made us all realize that the ocean was the ocean wherever you cruised. The ships lost lifeboats, masts, and ventilators, but came through on time.

The visit to Japan was a real diplomatic mission. Relations between the two countries had been strained to the utmost in 1907, because of the California immigration laws. The Japanese people were very much incensed, and, flushed with their success in the war with Russia, they were ready for any eventuality. The statesmen of both countries were trying to keep the peace.

This visit served two purposes: first, the friendly visit of the fleet, the intermingling of officers and men of the two services, aroused a feeling of good fellowship; second, the discreet show of force demonstrated that the United States fleet was a different nut to crack than the Russian fleet.

The fleet was received with the greatest acclaim, was entertained royally, showed its appreciation and probably did more to relieve the tension than all the diplomatic notes—this in spite of the claims of some people that the Navy strives to bring on war.

The School for Scandal

At times the Williamstown Institute of Politics reminds one of a sewing circle, with all the weaknesses of the sewing circle. Lots of chatter, but not much work done.

Although the United States acts as host, most of the gossip is aimed at us. The speakers lecture us on any and all subjects.

The latest fear is that, on account of the vast amounts of money being loaned abroad, the Navy of the United States may, in time, be used to collect debts. The natural deduction is, that if foreign nations *must* borrow money, we should reduce our Navy!

Our Navy never has been used to collect debts. The Navy *has* protected weak countries from such force being applied by other nations.

The lecturer draws a comparison as between collecting debts by force and by the processes of bankruptcy in civil life. But he neglects to mention the fact that the civil laws would have no effect but for the force that lies behind the law. Nor does he mention that the bankrupt is obliged to give up all his money and chattels to satisfy his creditors. He is left free of debt, but he is also free of everything else except the necessity of working in order to live.

What would the lecturer say if the United States ejected the people of a debtor state, took their money and goods, and told them to go ahead and do the best they could elsewhere? Instead, the United States has helped debtor nations to straighten up their affairs, pay their debts to others as well as ourselves, and then left them to themselves.

If Williamstown wants to compare methods, why not discuss the results in the Philip-

Secretary of the Treasury Andrew Mellon performed the unveiling ceremony and made the opening address.

pines as compared to India, in Cuba as compared to Egypt, in Porto Rico as compared to Ceylon, in American Samoa as compared to other groups, in Haiti as compared to the Congo, and Hawaii as compared to Trinidad? And we have only been in the business some thirty years!

No Apologies Necessary

The Navy of the United States has a distinct duty to the people of the United States. When it satisfactorily performs this duty, it has no need to apologize for its being.

In time of war, the Navy's duty requires the maximum sacrifice, if need be, to insure the safety of the country.

In time of peace, it is the Navy's duty to prepare for war. It should spare no effort to make the forces at hand the most efficient of their kind. In addition, it is the Navy's duty to see that the Navy is supplied with the best equipment available, and in sufficient quantities for the needs of the country.

Any organization which does not look beyond its nose is bound to fail. If we stand idly by while absurd propagandists weaken our first line of defense, we are as guilty of criminal negligence as though we fail to prepare for battle, when battle is imminent.

The country will respect a man who boldly expresses an honest opinion, especially if this opinion is backed up by facts. Therefore, it behooves the Navy to set forth its needs.

When our Navy is obliged to operate cruisers that fought thirty years ago in the war with Spain, when we are dependent upon cruisers that the World War proved futile, it is time to awaken the public.

Cruisers that have ten knots less speed than heavier-gunned ships, that have four knots less speed than many foreign battleships, have no reason to be on the Navy list, except for the fact that we have not enough modern cruisers.

This country believes in the sporting chance. We are not giving our men a sporting chance if we send them to war in such ships. The men who go forth to battle in these ships will be from every part of the country, the sons of those who are now in a position to give them an even chance.

Ship-to-Shore Service

Recently a significant thing was accomplished by a French liner. A plane, with one passenger and a load of air mail, left the ship 400 miles offshore and proceeded to port.

Now, let us look at this from a military point of view. Supposing a fleet of carriers arrived 400 miles offshore at dawn. (They could have been 700 miles offshore the night before.) That means that an area extending offshore more than 700 miles must be kept clear of enemy craft to be secure from such an attack.

What types of ships are needed to locate a fast-moving group of aircraft-carrying ships? Cruisers, with high speed, heavy guns, and scouting planes; with enough cruising radius to keep the sea for long periods of time; and with enough gun-power to protect themselves while carrying out their mission. The enemy must be located in time for the defense forces to act, otherwise the attack will get home.

Yet this type of ship is the one being blocked by our pacifists; that foreign naval experts are trying to keep us from building.

To whom will the country look for advice on such an important matter? We hope, to our own naval advisers.

London Bridge May Fall Down

Elaborate war games have satisfied the British that London is not immune to air attack. The French hail the demonstration as further evidence for the need of an *understanding* between France and England. The shores of England are not so distant as in Napoleon's day; British control of the sea no longer renders her secure from the effects of war.

All of which presages new political alliances and adjustments. The time may come when Napoleon's vision of a United States of Europe will become an accomplished fact.

The Multilateral Treaty

The Kellogg treaty is probably the shortest document of its kind ever offered. The first article dismisses war as an instrument of policy, in forty words; the second article prescribes pacific means for the settlement of all disputes, in thirty-eight words. The third article, which covers the mechanics of ratification, is, of necessity, longer.

Whether the treaty will accomplish what is hoped of it depends entirely upon the good faith of the contracting parties. Unquestionably, there will be mental reservations and actual reservations attached to the ratifications.

For instance, we cannot imagine that this means the abandonment of the Monroe Doctrine; nor do we believe that countries will passively allow other nationalities to stir up insurrection and anarchy, by means of agents and propaganda.

If nations actually wish to avoid war and do not use the treaty as a screen, then the treaty has prospects of success. At any rate, when the Senate of the United States, which has a reputation for picking out the weaknesses of treaties, has finished its discussion of this treaty, we and the world at large will have a better idea as to what to expect from it.

Off with the Old and On with the New

In 1922 we hailed with delight the ending of the *understanding* between England and Japan. Of course the United States contributed a lot to bring about this state of affairs. But it was felt that the net result was for peace in the Pacific. Nobody ever believed that England would enter a war between Japan and the United States on the side of Japan. Nevertheless, we paid a good deal to make sure.

Now we have an *understanding* between France and England. No one seems to know just how far this understanding goes, nor its purposes. It is said to be for the purpose of reducing armaments. But whose armaments? Are the combined British and French fleets to be considered to be available for any crisis of either the French or British?

The understanding may be for the object of insuring the peace in Europe, and of course we never will have the combined fleets opposed to the United States, but what will we have to give up this time to make sure?

150,000 Years Ago

The latest expedition into the Mongolian desert indicates that man was just as restless one hundred and fifty thousand years ago as he is today. What with civilization having existed, having advanced in the arts and sciences, and then having been wiped out by some catastrophe, we are becoming more and more confused as to the accuracy of history as it is written.

We are beginning to believe that the "long count" was used in creating the world in six days.

Why? Just why is it that every time a treaty is proposed by the United States, or whenever anything is proposed to Europe in the nature of an agreement, European statesmen immediately seize it as an indication that we are abandoning the Monroe Doctrine?

Europe now has equal commercial opportunities in the Americas; does she hope to gain political advantages in this hemisphere? And at this late date?

Heaven forbid! The Americas have gotten along very well under the Monroe Doctrine. In North America, except for civil disturbances, we have gotten along for over eighty years without warring with our neighbors. In South America there have been some spats, but nothing comparable to the turmoil of Europe.

The European political system would not work in the Americas, where we are accustomed to "live and let live."

Christmas Is Coming When thinking about what to give your friends for Christmas, why not make use of the Naval Institute Proceedings and publications?

A subscription to the Proceedings becomes a present arriving twelve times a year.

Matthew Fontaine Maury: Pathfinder of the Seas is a very beautiful and valuable book. Few of us know that the *Maury's Geography,* which we studied in school, was compiled by this same Maury.

Von Sanders' *Five Years in Turkey* is a splendid book for those interested in vital phases of the World War.

Then there are other technical books, such as *Robison's Manual of Radio Telegraphy and Telephony,* etc., that would make useful presents.

Pictorial Record of the Cruise Around the World 1907-1909 The Proceedings have been publishing some very beautiful pictures of this famous cruise. Most of us failed to keep such records of the cruise as we obtained, or else failed to obtain them. It is wondered if the service at large and those who made the cruise, who are now in the Navy, retired, or in civil life, would be interested in a book of pictures of the cruise?

It would be perfectly feasible to prepare such a book from the pictures that have been appearing in the Proceedings, making a pictorial log of the cruise at a nominal cost. The cost of the book would be prohibitive if the plates had not already been made.

Please let us know your reaction to the idea.